This electronic thesis or dissertation has been downloaded from the King's Research Portal at https://kclpure.kcl.ac.uk/portal/

KING'S College LONDON

Challenges to American Military and Economic Dominance in Space

Presley, Mark

Awarding institution:
University of Cambridge

The copyright of this thesis rests with the author and no quotation from it or information derived from it may be published without proper acknowledgement.

END USER LICENCE AGREEMENT

Unless another licence is stated on the immediately following page this work is licensed

under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

licence. https://creativecommons.org/licenses/by-nc-nd/4.0/

You are free to copy, distribute and transmit the work

Under the following conditions:

- Attribution: You must attribute the work in the manner specified by the author (but not in any way that suggests that they endorse you or your use of the work).
- Non Commercial: You may not use this work for commercial purposes.
- No Derivative Works - You may not alter, transform, or build upon this work.

Any of these conditions can be waived if you receive permission from the author. Your fair dealings and other rights are in no way affected by the above.

Take down policy

If you believe that this document breaches copyright please contact librarypure@kcl.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.

Download date: 05. May. 2023

This electronic theses or dissertation has been downloaded from the King's Research Portal at https://kclpure.kcl.ac.uk/portal/

KING'S College LONDON

Title: Challenges to American Military and Economic Dominance in Space

Author: Mark Presley

The copyright of this thesis rests with the author and no quotation from it or information derived from it may be published without proper acknowledgement.

END USER LICENSE AGREEMENT

This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License. http://creativecommons.org/licenses/by-nc-nd/3.0/

You are free to:

- Share: to copy, distribute and transmit the work

Under the following conditions:

- Attribution: You must attribute the work in the manner specified by the author (but not in any way that suggests that they endorse you or your use of the work).
- Non Commercial: You may not use this work for commercial purposes.
- No Derivative Works - You may not alter, transform, or build upon this work.

Any of these conditions can be waived if you receive permission from the author. Your fair dealings and other rights are in no way affected by the above.

Take down policy

If you believe that this document breaches copyright please contact librarypure@kcl.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.

University of Cambridge
Centre of International Studies

CHALLENGES TO AMERICAN MILITARY AND ECONOMIC DOMINANCE IN SPACE

Wing Commander M A Presley MBA MCMI RAF

Candidate for the MPhil in International Relations

Trinity Hall College
Cambridge
July 2007

This thesis is submitted in partial fulfilment of the requirement for the Master of Philosophy in International Relations

Abstract

The US competed for leadership in space with the Soviet Union throughout the Cold War. Losing to the Soviet *Sputnik* and failing to achieve the first manned flight in space hurt US pride and gave credibility to Russian missile claims. Rising to this challenge under the leadership of President Kennedy, the nation rallied behind the cause of sending a man to the moon and safely returning him to earth, galvanising the might of American civil, military, economic and political power to win the Space Race and recapture American prestige, technological dominance and leadership in space. The US has nurtured this dominance by extending the military use of space to create an asymmetric advantage that remains beyond the reach of any other nation. Leakage of any space-related technology has been smothered by regulation and attempts to formalise the governance of activities in space through international treaties have been vigorously resisted. The growing hubris of American foreign policy strategy has contributed to resistance to American hegemony and challenges to US dominance in space. Rising great powers seek to emulate US military technological dominance in space whilst seeking ways to level the playing field. Confined by regulation to their home market, the US space industry has been unable to compete, leaving the non-US space industry to thrive, challenging the traditional US lead. Debris, proliferation of satellites from a variety of actors and the potential vulnerability of US capability from small satellites has contributed to US nervousness. Stretched by other pressing national security matters, the true imperative of challenges to US dominance in space are not apparent. Recognition of the challenges is essential if America is to maintain dominance in space.

Contents

Acknowledgements

I would first and foremost like to register thanks to my supervisor, Dr Phillip Towle, for his support, encouragement, direction and unfailing interest.

I would also like to thank the Royal Air Force for providing the opportunity for me to study at Cambridge and for allowing me the freedom to gain the full benefit of this year of study. In particular, I would like to thank the Director of Defence Studies (Royal Air Force) and his staff for the support throughout the year.

I am also grateful to the many serving officers of this county and in the United States; to the civil servants and to members of the space industry who gave their time and shared their opinions with me on the challenges faced in space by the United States that proved so valuable in providing the context for my work.

Finally, to Debra, Emma, Isobel and Katie for their patience, support and encouragement throughout this extraordinary year, thank you.

List of Abbreviations

BMD	Ballistic Missile Defence
COPUOS	Committee on the Peaceful Use of Outer Space
COTS	Commercial Off The Shelf
DoD	Department of Defence
DTSA	Defence Technology Security Administration
FASOC	Future Air and Space Operational Concept
GPS	Global Positioning System
ICBM	Inter Continental Ballistic Missile
ITAR	International Traffic in Arms Regulations
JDAM	Joint Direct Attack Munition
JPL	Jet Propulsion Laboratory
NASA	National Aeronautics and Space Administration
NGA	National Geospatial intelligence Agency
NRO	National Reconnaissance Office
NSC	National Security Council
PAROS	Prevention of an Arms Race in Outer Space
SBIRS	Space Based Infra Red System
SDI	Strategic Defence Initiative
SMEC	Strategic Missiles Evaluation Committee
SNAP-1	Surrey Nanosatellite Applications Platform 1
SSA	Space Situational Awareness
SSTL	Surrey Satellite Technology Limited
WMD	Weapons of Mass Destruction

CHALLENGES TO AMERICAN MILITARY AND ECONOMIC DOMINANCE IN SPACE

In the eyes of the world first in space means first, period; second in space is second in everything

President Lyndon Johnson[1]

INTRODUCTION

Ronald Reagan succinctly captured the enduring goals and principles for American space posture in his Presidential Directive on National Space Policy of 1988, declaring that "a fundamental objective guiding United States space activities has been, and continues to be, space leadership"[2]. Leadership in space not only confers a military, intelligence and commercial advantage, it also bestows prestige. Exceptionalism forms a deep-seated element of the American psyche and the prestige and perceptions on which this is built have always been as important as technological capability reflected in leadership in space for the US. Walter McDougall, the winner of the 1986 Pulitzer Prize for History with his book *The Heavens and the Earth*, captured the importance of prestige and the perception in the eyes of the world of the US as the technologically pre-eminent nation. This perception is not only important for the US psyche but, in the opinion expressed in the book, it is also important for maintaining a successful balance of a liberal world order. McDougal claimed that "the security of the United States might depend solely on the latter [perception of the US as a technological leader],

[1] President Lyndon Johnson, quoted in Richard Hirsch and Joseph Trento, *The National Aeronautics and Space Administration,* (New York, 1973), p108, cited in Walter A. McDougall, *The Heavens and the Earth: A Political History of the Space Age,* (New York, 1985), p320.
[2] Declassified excerpt from NSDD 293, *Presidential Directive on National Space Policy,* (5 January 1988).

but the health of the free-world alliance and the liberal values that cemented it depended on continued belief in American dynamism"[3] and thus, space has played a key role in establishing the technological prestige associated with perceived leadership in space.

Space is a burgeoning international arena; there is ever greater dependence on the space-based assets that enable the technological infrastructure that we take for granted today. Commercial satellites are creating global networks that are critical to international communications, civil navigation, weather forecasting and global financial markets. Space-based equipment plays an ever increasing military role in maintaining contact with dispersed troops, conducting reconnaissance, navigation and timing and providing targeting information for precision-guided weapons[4]. Space also plays a key role in verifying arms control and non-proliferation treaties. Given this escalating global reliance on space, challenges to space security – ranging from military to environmental to legal and criminal – require ever greater attention. Preservation of access to space and the freedom to operate in space are critical to many states but particularly to the US.

During the Cold War, the marriage of the rocket and the atomic bomb elevated space into the realm of national security. There were few space-

[3] Walter A. McDougall, *The Heavens and the Earth: A Political History of the Space Age,* (New York, 1985), p179.

[4] The Royal Air Force Future Air and Space Operational Concept (FASOC) illustrates the growing use of satellite communications by highlighting that During Operation DESERT STORM a force of 542,000 exploited 99 megabits per second of bandwidth available; during Operation IRAQI FREEDOM a reduced force of some 350,000 had 3,200 megabits per second of bandwidth allocated. This increased bandwidth allowed unprecedented shared awareness, enabled synchronised engagements and allowed operational and tactical commanders to implement sophisticated campaign plans.

faring nations and the dominant states (the US and the Soviet Union) evolved towards a mutual military restraint backed up by diligent monitoring and the development of a series of treaties that helped keep the situation stable and space free for each to exploit. That stable bi-polarity disintegrated with the end of the Cold War to be replaced by a uni-polarity dominated by a hegemonic US. Since then, the emergence of additional states possessing the capability of launching satellites into orbit has raised new questions and posed new challenges about the adequacy of security arrangements, the complexity of technological and commercial overlap with the military sector and the proliferation of satellites and debris in orbit. There are various schools of thought regarding responses to these challenges to US dominance. Some have suggested new military means as the only realistic way of dealing with the challenge others have suggested that political and legal mechanisms would be preferable and would avoid the dangers of the action and reaction of a security dilemma in space. The aim of this paper is to understand how the US arrived at their position of dominance by tracking their journey through the space age, how they responded to the one great challenge presented to them by the Soviets and thus won the Space Race. Having considered the journey and the one great challenge, this paper will consider some of the foreign policy grand strategies that the US has adopted with an eye to their impact on US dominance in space. Finally, a consideration of the background to and the implications of the security, economic, environmental and legal challenges that the US face in space will be explored before concluding.

CHAPTER 1

Space Prestige in Context

Cold wars cannot be won by hotheads. Nor can ideological conflicts be won as crusades or concluded by unconditional surrender.

Walter Lippman (1949)[5]

The US is the world leader in space technology and its application, apart from Russia's residue of the many Cold War Soviet satellites, the US has significantly more satellites in orbit than any other nation or agency with some 889 satellites in orbit in 2003. This is compared with Japan, the next highest, with 80 satellites, the European Space Agency with 33 and commercial organizations such as Intelsat and Globalstar with 60 and 52 satellites respectively[6]. The US leadership in space was gained in the Space Race and has not been relinquished; indeed, the margin of leadership in this celestial environment is so significant that it should more accurately be labelled space dominance. To be dominant the US would need to be the most important, powerful or influential actor in space and there is little to suggest this is not the case[7]. The dominance exerted by the US also fits neatly with the military description of space superiority which demands "a degree of dominance in space of one force over another that permits the conduct of operations by the former and its related land, sea, air, space and special operations forces at a given time and place without the prohibitive

[5] Walter Lippman, *The Russian-American War,* (1949), cited in Vannevar Bush, *Modern Arms and Free Men: A Discussion of the Role of Science in Preserving Democracy,* (MIT Press, 2nd Edition, 1968), p158.
[6] Tamer A. Mehuron, *2003 Space Almanac,* Air Force Magazine, (August 2003), p24, cited in Michael E. O'Hanlon, *Neither Star Wars nor Sanctuary: Constraining the Military Uses of Space,* (Brookings Institution Press, Washington DC, 2004), pp36-37.
[7] Oxford Compact English Dictionary, Second Edition, Revised (2006), p322.

interference by the opposing force"[8]. These definitions certainly fit the current US dominance in space which is assumed here and consequently, the term dominance is used interchangeably with leadership throughout this paper to describe the unrivalled US advantage.

Space – Taken for granted or Prestige Enhancing?

Space has always triggered the imagination and stood as a symbol of national technological achievement and ambition. It has been the backdrop for great tales of adventure and exploration from Yuri Gregarin to Neil Armstrong and potential future journeys of discovery fuelled by films such as Star Wars, television programmes such as 'Lost in Space' and the writings of authors such as Jules Verne, H. G. Wells, Isaac Asimov and Arthur C. Clarke. These stories were the backdrop against which the real saga of the Space Age was played out and contributed to the reason why it become such a high-profile arena for a pivotal Cold War race that represented national virility, technical mastery and military dominance; a race that held such prestige that the very credibility of two Great Powers was at stake. Today, space plays an increasingly important part in the everyday lives of everyone on the planet. Activities we take for granted such as global communications, an international banking system (reliant on the US Global Positioning System (GPS)), accurate weather forecasting, earth observation available at the click of a mouse button at sites such as Google Earth would all be staggering to the man on the street merely 50 years ago. The paradox is that now space-

[8] US Joint Publication 3-14, *Joint Doctrine for Space Operations,* (9 August 2002), pGL-6, www.dtic.mil/doctrine/je/new_pubs/jp3_14.pdf.

based capability has become such an everyday part of the lives of the developed world, it may also have lost some of its mystery and romanticism. Whilst space-based capability has increased in importance to become a vital part of the functioning of everyday life, it has also become a 'taken-for-granted' commodity that has slipped from the limelight in competition with other exciting technological and scientific frontiers. Because of this shift in perception, is space still as important a part of national prestige as it once was? Is maintaining capability in space simply on par with the capability of other states satisfactory or is it still necessary to be a dominant leader in such a crucial environment? The number of states that now have a space capability is growing and the gap between the capability of the US and that of their main peer rivals, such as Europe, in satellite communications, and China, in space launch, is closing to the point where they may rival and challenge the US leadership in space.

The futuristic novels of Arthur C. Clarke and the remarkably prescient writings of Konstantin Tsiolkovsky[9] presaged the beginning of the space age and the Space Race which arguably began at the end of World War II as the Russians and the Americans raced to capture the V-2 rocket technology designed and developed by Wernher von Braun and his team in Peenemünde. From the low and slow unmanned, winged cylinder which was the*Vergeltungswaffe-1* (V-1) which the English fighters strained to intercept came the invulnerable ballistic V-2 rocket; truly a weapon of terror that left an indelible imprint in the mind that is evident today. The V-2 flew in a long arc,

[9] Konstantin Tsiolkovsky (1857-1935) was a Russian scientist and philosopher recognised around the world as the founder of the modern theory of space flight with his books: *Investigations of Outer Space by Rocket Devices* (1911) and *Aims of Astronauts* (1914).

high into the stratosphere and descended at three thousand miles per hour, faster than the speed of sound and so ensuring a silent arrival. The roar of its flight to the unfortunate destination was heard only after the ton of high explosives had detonated, destroying some part of London or other targeted city[10]. The cost of the V-2 development and of each rocket was far in excess of the cost of delivering the same ton of explosives over London by the traditional means of bombing raids. It was a prestigious weapon which carried huge psychological impact; it was a weapon of terror. Rocketry had started to have an impact that was more wide-reaching than the actual technological achievement. After the end of WWII, the Space Race heated up as the US and the Soviets each strove to develop a rocket to carry a nuclear payload, the Race then went into orbit with the launch of *Sputnik I* in 1957, climaxed with the landing of Apollo 11 on the Moon in July 1969, declined during détente and left the US as unequivocal leaders in space with the talismanic space shuttle capturing the headlines and the Soviet Union collapsing in 1991. Space still carries with it a kudos that bestows a technological prestige that belies the every-day nature of many of the capabilities it enables.

US Technocratic Exceptionalism

During the Cold War the Space Race and nuclear deterrence tied the US to rapid technological change at the same time as the Soviet technocracy committed itself to similar changes and particularly to embracing the missile

[10] During WWII there were 1115 V-2 impacts (517 in Greater London) killing 2854 and seriously injuring 6268.

revolution. The Presidential efforts of the parsimonious Eisenhower to rein in defence spending, search for a negotiated freeze on arms and the avoidance of growing paranoia about the secretive Soviet Union, all played a part in the failure of the US to be first into space. This failure hit hard in the land of the Wright brothers where the notion that science was the key to rational progress and that, in a form of Social Darwinism, civilization itself evolved at the pace of its creation of new knowledge and it was the US that should be leading this evolution. The sense of inferiority after the success of *Sputnik I* was compounded on 6 December 1957 at Cape Canaveral when, 2 seconds after ignition, the US Navy Vanguard rocket rose momentarily before thunderously exploding in front of the gathered world media. The US humiliation was complete. Jibes of 'Kaputnik', 'Stayputnik' and 'Flopnik' were tossed around and the bitter pill of failure was made even more bitter by ostentatious Soviet offers of aid at the UN. Consequently, the ignominy of the Soviet first had a sting that spurred the US on and set the seeds for the US determination to recover their position as the world's technological leader, symbolized by leadership in space.

On 4 October 1957, Lyndon B. Johnson, Senate Majority Leader, was strolling around his Texas ranch after dinner following news of the Soviet satellite success. He commented to his guests as he gazed at the stars on "the profound shock of realizing that it might be possible for another nation to achieve technological superiority over this great country of ours"[11]. In history, the Romans controlled their world because of their roads, Britain controlled

[11] Lyndon Baines Johnson, *The Vantage Point: Perspectives of the Presidency 1963-1969,* (New York, 1971), p272.

her empire because of maritime power secured by her ships, and the US was supreme in aviation; now the Soviets had moved into space. It was a lead the US was not prepared to allow the Soviets to retain. In their pursuit of the prestige associated with leadership in space, there was a tension between the US publicly stated aims for space and the shadow military and intelligence aims. The US had proposed through President Eisenhower early in the space age that "outer space be used only for peaceful purposes"[12], reflecting the traditional American idealism and liberal principles. In adopting this public 'open sky' position, America also encouraged other nations to venture into space. The current US Space Policy proclaims the importance of freedom of action in space whilst also retaining the right to "deny, if necessary, adversaries the use of space capabilities hostile to U.S. national interests"[13]. As many other nations seek to reach the level of sophistication of the US in space, so they too will step through the various stages of growth to develop the sophistication to not only use satellites effectively in space but also develop the potential to protect that capability if necessary.

China had its first fumbling adolescent experience of pushing the boundaries of its space capability when, on 11 January 2007, it launched an anti-satellite missile and destroyed one of its own weather satellites in orbit[14]. The Chinese anti-satellite test sparked discussion on the Chinese motives for the test and provided ammunition for the more belligerent US proponents of a

[12] Letter to from President Eisenhower to Premier Bulganin, 13 January 1958, quoted in National Security Council Planning Board, NSC 5814/1, *Preliminary US Policy on Outer Space,* Dwight D. Eisenhower Presidential Library and Museum, (20 June, 1958), p11.
[13] NSPD 49, *U.S. National Space Policy*, (31 August 2006), p2.
[14] The Fen Yung 1C weather satellite was intercepted and destroyed by a ballistic missile at an altitude of some 537miles, fragmenting the satellite into thousands of pieces. The subsequent debris stretches around the earth at altitudes ranging from 200 to 3,800Km.

more robust military space posture. Some analysts have argued that the motive for the Chinese test, other than the technological need to prove a nascent anti-satellite capability, was the demonstration of a space defence capability. In the absence of space security talks between the US and China during its growth as a space nation, Beijing decided it needed to develop a "limited defence capability" as a 'hedge' policy until some form of collective security mechanisms were established[15]. The corollary on the US side was that the Chinese anti-satellite event spurred greater exploration of a more Operationally Responsive Space posture in the US aimed at generating an ability to rapidly construct, launch and operate satellites to replace any damaged in flight and ensuring continuity of operations[16]. The Chinese anti-satellite test highlighted the growing tension between the US as the hegemonic terrestrial and space power and the challenge posed by China as an emerging great space power. It also illustrated the potential for an escalatory space security dilemma to emerge. As China matures its space capability and seeks to increase its security, so the US interprets the maturity as a corresponding decrease in its own security and so sees a growing challenge and responds accordingly[17]. And so the cycle continues.

[15] Dr. James Clay Moltz (Deputy Director, Centre for Nonproliferation Studies, Monterey Institute of International Studies), *Charting a Course for Improved US Space Security,* written testimony to the US Congress Subcommittee on National Security and Foreign Affairs, (23 May 2007), p4.
[16] MOD, Director of the Air Staff, Strategy Space, in discussion with the author, 18 April 2007.
[17] Robert Jervis, *Cooperation Under the Security Dilemma,* World Politics (Vol. 30, No. 2. January 1978), p169.

The Space Challenges Faced by the US

The US faces a number of challenges to its leadership in space that can be grouped into four distinct areas. First of all is the proliferation in the number of nations with a space capability and in particular the rise of China as a space power and the potential for escalation in the weaponization of space. Second is the environmental security challenge posed by the increase in the number of satellites in orbit and the space debris generated by the proliferation of space faring nations and the potential threat it poses to the security of US satellites. The third challenge is the commercial challenge posed by a rapidly expanding global space industry for both satellite manufacture and for service provision, the overlap of military and commercial provision and the dual-use technology employed. Finally, there remains a more general challenge to establish a governance structure to administer the activities of space-faring nations. This latter challenge could encompass either a loosely established voluntary 'rules of the road' set of principles or the generation of more formal legal frameworks - both may constrain the US freedom of action in space. This paper aims to explore these challenges by taking a look at path the US followed to gain the leadership in space it enjoys today and by considering how America rose to the first and last great challenge it faced – the Cold War Space Race. Armed with an understanding of the US space heritage and the response to the Space Race, this paper will take a closer look at each of the four general areas in which the US faces challenges today. Finally, the impact of those challenges and the potential US responses will be considered.

CHAPTER 2

The Rise of America as the Space Hegemon

We the United States of America can be first. If we do not expend the thought, the effort, and the money required, then another and more progressive nation will. It will dominate space, and it will dominate the world.

James H. Doolittle (1959)[18]

The US 'Republic of Technology' and the Ballistic Missile Debate

Across the western world and particularly in America throughout the Cold War and into the present day, technology has been king and this has never been more so than in the technology associated with space. In Francis Bacon's seventeenth century utopia, *The New Atlantis,* the research scientists (merchants of light) took the place of the clergy and the philosopher-king their head, the research institute took the place of the church, and the earthly utopia that was Bensalem the place of the ethereal heaven[19]. Bacon later went on to coin the phrase "knowledge is power" and foresaw the emergence of human technological influence across all spheres. Nowhere is this truer than in the US which Daniel Boorstin suggested would become noted – some would even say notorious – as a land of technology. Boorstin went on to describe how American experimentalism expressed politically in the past as American federalism would become generalized today in an expression of

[18] Cited in the preface to Air Force Manual 6-1, *Military Space Doctrine,* (Washington, DC: Department of the Air Force, 15 October 1982), cited in Everett C. Dolman, *Astropolitik: Classical Geopolitics in the Space Age,* (Frank Cass, London), p86.
[19] Francis Bacon, *New Atlantis* (1626), The Internet Wiretap edition (1993), www.oregonstate.edu/instruct/phl302/texts/bacon/atlantis.html

American technology and would become the leitmotif of the American 'Republic of Technology'[20].

The true beginning of the association of space with the American technological bent can be traced back to when the rocket and the atomic bomb were married. At this point, the combination presented a threat that was central to US national security. The geographic protection afforded by the expanse of two great oceans and the providence of having benign neighbours no longer offered the security the nation had historically benefited from. The global reach of these new threats put paid to any policy of isolation. Freedom from the entangling alliances of the 'old world' ceased to be an option. Khrushchev's claims of Inter Continental Ballistic Missile (ICBM) capability and extent of the Soviet arsenal which was ahead of American capability in the early days of the Cold War generated a clear need for hard intelligence on those Soviet capabilities. This need served to persuade the highest officers of government that reconnaissance from space was not a folly but of key importance to future US security. If the promise of intelligence delivered from the 'high ground' of space was accepted, the need for a ballistic missile capability to deliver nuclear warheads across continents was not as clear. This lack of clarity on the requirement for an ICBM capability was the result of a number of contributing factors. In the budget conscious period following WWII, the American lead in medium-range bombers based close to the Soviet borders and able to strike deep into the heart of the Soviet Union detracted from the need to duplicate the means of delivering the US

[20] Daniel J. Boorstin, *The Republic of Technology: Reflections on Our Future Community* (New York, 1978), pp59-60.

nuclear deterrent. Unable to match the US bomber threat and transcend the great distances that insulated North America from the rest of the modern world, the Soviet's felt compelled to concentrate development efforts on ICBMs, proclaiming superiority in both technology and in capacity. The argument against using ballistic missiles was powerfully delivered by the US Air Force who lobbied hard to protect their manned bomber role. Yet, in the ten year period after WWII, missile technology evolved rapidly. Improvements in Soviet Air Defence also called into question the ability of the US to overcome these defences and deliver its nuclear strike from traditional bombers. At the same time, the Soviet ability to launch a first strike using ICBMs was becoming ever more credible with the emergence of the much smaller hydrogen bomb[21]. Ballistic missile technology was at the very cutting-edge of science and engineering and generated sufficient debate in the US between sceptics and enthusiasts to cast doubt over the ability of current or forecast rocket technology to deliver a nuclear warhead accurately through space to a target 5000 miles away. The debate continued until 1954 when the Strategic Missiles Evaluation Committee (SMEC) urged in its first report in February 1954, that the fastest possible development of a strategic rocket programme should be undertaken. Until this point, the debate only served to delay the US start in a fully fledged ballistic missile arms race.

Among the sceptics were some far-sighted and respected scientists; one of whom was Vannevar Bush. A prominent policy maker and public intellectual, Bush considered the role of science in the preservation of

[21] Everett C. Dolman, *Astropolitik: Classical Geopolitics in the Space Age,* (Frank Cass, London, 2002), p90.

democracy in one of his books published in 1949. In the book, he expressed considerable reservations about the ability to build an accurate ICBM at a reasonable cost to achieve a viable military objective claiming that "there is no such thing as an ocean-spanning rocket or guided missile capable of precisely hitting a target on another continent" and that "there will be no such thing for a long time to come …"[22]. The scepticism he expressed was more in terms of the cost and utility of ICBMs rather than the pure technology. His scepticism was subsequently found to be misplaced, leading him to further defend his original thesis in the later edition of his book published in 1968 by claiming that, at the time, missile technology did in fact make ICBMs impractical and that the use of such missiles was overplayed by the Services in a bid to secure appropriations. Nevertheless, his well argued scepticism was balanced by others who held a more optimistic, if qualified, enthusiasm for the capabilities of missiles and the utility of space in general. Among the enthusiasts was the Douglas Aircraft Company which published a report in May 1946 which would prove to be remarkably prescient. Whilst recognising in the report that "the crystal ball is cloudy", it uncannily captured the future importance of spaceflight in terms of the political, economic and military impact of leading in space. Understanding that whilst "we can see no more clearly all the utility and implications of spaceships than the Wright brothers could see the fleets of B-29's bombing Japan and air transports circling the globe", they also recognised that "the achievement of a satellite craft by the United States would inflame the imagination of mankind, and would probably produce repercussions in the world comparable to the explosion of the atomic

[22] Vannevar Bush, *Modern Arms and Free Men; a Discussion of the Role of Science in Preserving Democracy,* (MIT Press, 2nd Edition, 1968), p116.

bomb", even going as far as to reflect on the natural urge of man to explore, asking "whose imagination is not fired by the possibility of voyaging out beyond the limits of our earth, travelling to the Moon, to Venus and Mars?". Within the pragmatic bounding of the vision presented in the report and the inspiring possibilities space held, the report anticipated that "the satellite offers an observation aircraft which cannot be brought down by an enemy …" and that "a satellite offers the possibility of establishing a relay station above the earth, through which long-range communications can be maintained …"[23]. Whilst too early to foresee the delivery of nuclear weapons, it was enthusiastic and prophetic about the future capabilities of space in general and hinted at the potential military uses of missiles for the delivery of weapons between continents.

The doubt generated by debate between the space sceptics and the space enthusiasts was sufficient to cause the US authorities to hesitate in their commitment to space technology and in missiles particularly, despite the claims made by Khrushchev on the Soviet missile capability. The hesitation was enough to leave America lagging in the emerging Space Race and the military capability it spawned. The faltering, embryonic development of US space capability was arguably perceptual rather than material. Soviet claims have subsequently been found to be exaggerated and US engineering and technology at the time was arguably as good as if not better than the Soviet. Regardless of the reality of the position, the perception of a Soviet lead in

[23] Douglas Aircraft Company Ltd, *Preliminary Design of an Experimental World-Circling Spaceship* (Report No. SM-11827, 2 May, 1946), pp1-16.

space and missile technology was beginning to take hold and would gather pace throughout the 1950s.

Following the Apollo missions in the 1960s and the establishment of America as the dominant nation in space, a hiatus ensued. Approval of the US Space Shuttle development in 1972 by President Nixon amid the post-Apollo space policy chaos was the prelude to a troubled but renewed prestige space programme. Ronald Reagan reflected the consequent successes when, on taking office in 1981, he said the Shuttle team had "made us all feel like giants again"[24]. Despite programme challenges, conflict between NASA and Department of Defense (DoD) over cost and requirements and the subsequent Challenger disaster in 1986 and the Columbia disaster seven years later, the Shuttle has remained the flagship of the US space programme and, despite its chequered 30 year history, it will remain one of the great achievements of the 20th century. However, when the remaining Discovery, Atlantis and Endeavour spacecraft, their astronauts, crews and mission controllers finally cease operations in 2010, the US will be left without an imagination-grabbing totem for their space capability.

The rise to unqualified dominance in space is testament to US technological pre-eminence. Exploitation of the capabilities enabled by space-based assets by the military and the intelligence services is without equal whilst American companies have been at the vanguard of commercial exploitation of space. The US has also been a pivotal influence in the

[24] Quoted in Craig Covault, *Blame it on Nixon,* Aviation Weekly & Space Technology, (19 March, 2007), p84.

governance of space as a unique environment, drafting key legal principles and, latterly resisting legal and treaty proposals to further govern the conduct of actors in space. The US contribution in each of these areas will be considered in more detail.

Military Space Dominance and Vulnerability

Today, the US military has exploited the advantages of space-based capability to become the most technologically sophisticated military in the world. Precision navigation and timing delivered by the constellation of GPS Satellites is used to guide cruise missiles and other Joint Direct Attack Munition (JDAM) accurately to their target. Hundreds of GPS-guided JDAMs were used in the Kosovo war of 1999, more than 5000 JDAMs were employed in the Afghanistan war of 2001-02, striking within five meters of the aim point and more are being used today[25]. The precise timing of GPS is also used to synchronise tactical data networks. Weather satellites provide meteorological data for accurate weather forecasting, earth observation reconnaissance satellites supply imagery of targets and communications satellites link the whole force together to deliver a network-centric capability that is enabled by space-based assets. This space-enabled capability is unmatched by any other nation and gives the US military a winning technological edge. Technology delivers an undoubted advantage in conventional warfare and to an extent in counter-insurgency operations. It cannot be claimed to be a panacea but it is a key part in the particularly demanding operations of today.

[25] Department of Defense, *Conduct of the Persian Gulf War: Final Report to Congress,* (1992), pK-41, cited in Michael E. O'Hanlon, *Neither Star Wars Nor Sanctuary: Constraining the Military Uses of Space,* (The Brookings Institution, Washington, 2004), p3.

That the US has become so reliant on the technology delivered from space-based assets has also led to it becoming a potential Achilles heel for them. This was recognised as early as January 2001 when the then Secretary of Defense designate, Donald Rumsfeld in the unveiling of the report of the Space Commission he had headed, declared that "if the US is to avoid a 'space Pearl Harbour' it needs to take seriously the possibility of an attack on US space systems"[26]. An even more contemporary realisation of the importance of the space contribution and the risk of becoming too reliant on the technology it enables is reflected in the fact that the Israeli Defence Force is working on its plan to avoid over reliance on network-centric and space-enabled operations[27]. A recent RAND report claimed Chinese strategists had also concluded that networks "as large and complex as the ones the US military uses are … inherently unreliable and open to disruption through both hard and soft attacks"[28]. The critical importance of space to modern warfare is recognised but the security of the space-based assets and the supporting infrastructure is often taken for granted. It is not surprising, therefore, that the recent successful Chinese Anti-satellite test on 11 January 2007 caused such alarm in Washington. Indeed, General Mosely, Chief of Staff of the Air Force, commenting on the event identified it as "a strategically dislocating event. This is no different than when the Russians put Sputnik up in October 1957" [29]. The vulnerability of the US space capability is certainly

[26] Jean-Michel Stoullig, *Rumsfeld Commission Warns Against* "*Space Pearl Harbour*", Space Daily (11 January, 2001), http://www.spacedaily.com/news/bmdo-01b.html
[27] David A. Fulghum and Amy Butler, *Reassessing Space,* Aviation Week & Space Technology, (30 April, 2007), p28.
[28] Ibid, p28.
[29] Ibid, p28.

hitting home and the recent display of the Chinese anti-satellite capability has revealed the potential challenges and the asymmetric advantage that attackers enjoy over defenders of space assets. The proliferation of space and anti-space capabilities has US planners increasingly looking toward a comprehensive Space Situational Awareness (SSA) and a more operationally responsive space posture using constellations of small satellites and quick-response launchers to replace any lost capability on the one hand and as a means of neutralizing an adversary's satellites on the other. This emphasis was neatly summarized by Major General James Armor, Director of the National Security Space Organization in Washington, when he described space as no longer the sanctuary it once was and that "any system built that is critical to national infrastructure needs to be robust – it cannot be taken out by a 'cheap shot' such as a terrorist attack on a ground station"[30]. Reaction to any military challenge to the security and freedom of operation of a US satellite would definitely draw a response if attribution could be determined. The response would be swift and proportionate but it may not involve the denial or destruction of the space-based element of the adversary's capability. The US military, led by the US Air Force, understand space and how to deal with the challenges faced in four doctrinal areas: space support, force enhancement, space control and force application. The issues giving rise to challenges in each of these four areas will be briefly explored.

A key tenet of space support is space launch. The imminent end to the Space Shuttle programme in 2010 and the limited capacity of the Delta and

[30] Major General James Armor, *Director, National Security Space Organisation,* in discussion with the author, 12 June 2007.

Titan launch rockets restricts US access to space. This limited fleet is aged, less reliable than the US would like to admit and consequently expensive. Less costly and more available launch opportunities provided by other nations are drawing commercial business away from the US. Whilst this reduces the demand on US launch, it is still not sufficient to meet the demand or reach the responsiveness envisaged by the emerging Operationally Responsive Space concept. Furthermore, US commercial satellite manufacturers are reluctant to use foreign, particularly Chinese, launches because of US International Traffic in Arms (ITAR) regulations. Elon Musk, a US entrepreneur, is developing the Falcon 1 small rocket that may address some of these problems but the lack of launch capacity continues to limit the US.

The use of space-based capability across all military and security activity to enable communications, navigation, precision timing, meteorology and many other functions continues to play an increasingly important role. Force enhancement is therefore a key role for space. The increased demand placed on aged existing satellites by the US pursuit of the war on terror and the continued entanglements in Iraq and Afghanistan using ever more sophisticated space-enabled technology is a drain on existing capacity. This drain is reducing the availability of US provided space capability to friends and allies that have traditionally shared in the dominant US space capability. Delay in the acquisition of replacement and new capability (such as proposals for space-based radar) is serving to delay any respite in the burden. Finally, budget demands are serving to create a delta between what the US space

policy aims to achieve and what it is pragmatically able to deliver, leaving room for challengers to close the gap.

Analogous to control of the sea or air, space control encompasses those measures necessary to secure freedom of action in space. The US has explored concepts of space control and to ensure their lead is maintained it is necessary to develop a 'hedging' strategy by ensuring that the US is not surpassed, surprised or technologically outdistanced by space control capabilities that any other state can achieve[31]. Maintaining this lead whilst also espousing non-weaponization of space but avoiding limiting its freedom of action in space by signing up to formal treaties, such as the Prevention of an Arms Race in Outer Space (PAROS) is a balancing act that will make resisting developments in active space control by other states difficult to accomplish. However, weaponization of space is not in the US interest or in the interest of any other space-faring nation and so the rational self-interest of states and the cooperative good have resulted in a delicate status quo. Mitigation against any potential threat by employing smaller more responsive and agile satellites to provide much of the capability and, by having more satellites available, contributing to a more robust and resilient constellation, is one way the US is addressing the challenge. Coupled with a SSA to increase the transparency of activity in space and increase confidence as access to space proliferates will all contribute to the maintenance of the status quo. However, access to space from an increasing number of states and non-state actors will continue to present a greater number of potential threats or

[31] Michael E. O'Hanlon, *Neither Star Wars Nor Sanctuary: Constraining the Military Uses of Space,* (Brookings Institute Press, Washington DC, 2004), p133.

opportunities for misinterpretation of action that continue to present the US with a space control challenge.

Force application is defined as operations consisting of attacks against terrestrial-based targets carried out by military weapons systems operating in or through space[32]. This is the most contentious area of US military space doctrine. A similar conundrum to achieving effective space control, exploration of the technology and the 'art of the possible' in force enhancement should help ameliorate any potential surprises and is a prudent measure as an insurance policy to support faith in the promises of other nations. Equally, publicising some of the more 'exotic' options of force enhancement, such as hypervelocity rod bundles, so-called 'rods from god', in the *Transformational Flight Plan* has not helped the US credibility in international fora when seeking to deny accusations of weaponizing space[33]. Balancing the two will help avoid any misunderstanding that could potentially trigger an 'arms race in space' between the US and another ambitious space nation as part of a classic security dilemma.

Any race to develop space weapons as part of space control or force enhancement will cause two unfortunate sets of consequences. Militarily, it would legitimate a faster arms race – something that can only be detrimental to a country that effectively dominates military space activities today. Second, it would reinforce the current prevalent image of a unilateralist US, too quick

[32] US Joint Publication 3-14, *Joint Doctrine for Space Operations,* (9 August 2002), www.dtic.mil/doctrine/je/new_pubs/jp3_14.pdf.
[33] *The US Transformational Flight Plan,* (HQ USAF/XPXC November 2003), http://www.af.mil/library/posture/AF_TRANS_FLIGHT_PLAN-2003.pdf, p66.

to reach for the gun and impervious to the will of others[34]. In sum, the US military is the most technologically advanced in the world and much of the advantage it enjoys is enabled by its unrivalled space capability. Born out of Wernher von Braun's ballistic missile technology of WWII, accelerated through the Space Race and left leading the world as the Soviet Union collapsed, the US military space capability has enjoyed unparalleled success. As the number of space-faring nations increases and the US becomes ever more stretched, challenges are beginning to emerge. The ambition of China, the proliferation of multinational commercial interests and the increasing access to space-based capability by states and sub-state actors means that the potential military challenge is extending and deepening. The US must be wary of these challenges but caution against inappropriate signalling that could trigger a security dilemma and precipitate an arms race in space.

Commercial and Economic Dominance

Satellite telecommunications are forecast to continue their prolific contribution to global economic growth. Satellite navigation will be part of every mobile phone, car, aeroplane and ship. It will track every high value asset as it moves around the world and it will more than likely grow to be part of road user charging, prisoner tagging and emergency services location. With such a growing and increasingly global use of space-enabled technology, the potential commercial growth in the space industry should be very healthy indeed. It is forecast that the global space industry will rise from

[34] Michael E. O'Hanlon, *Neither Star Wars Nor Sanctuary: Constraining the Military Uses of Space,* (Brookings Institution Press, Washington DC, 2004), p121.

the estimated $25 billion today to be worth more than $1 trillion by 2020. This projected global expansion is reflected in the UK space industry growth of 10% per year since 1999/00[35].

The American commercial space industry has been a world leader since the beginning of the Space Age. However, the consolidation of aerospace industries in recent times has decreased the flexibility and responsiveness of the US space industry during a period of rapid global expansion driven by an increase in the number of customers seeking an affordable and innovative means of gaining access to space capability. The merger of Lockheed/Martin/Grumman and the merger of Boeing/McDonnell/Douglass illustrate the concentration of space technology in the hands of a commercial oligopoly matched by a complimentary contracting government oligopsony of organisations such as the National Aeronautics and Space Administration (NASA), the US Air Force and the black space programmes of the National Reconnaissance Office (NRO) and the National Geospatial-intelligence Agency (NGA). These huge corporations and parallel contracting organizations have been criticized, most colourfully by US Air Force (Retired) Brigadier General Simon 'Pete' Worden who characterized the largest trio of US aerospace industry corporations as "the three stooges"[36]. The US space industry has access to huge resources but their colossal size makes them slow to react to the rapid technological advances and exploitation trends that emerge, they find it difficult to change and adapt to meet these needs and, above all, have deep-seated vested

[35] UK Space, *Case4Space Summary Report*, October 2006. p1 and p4.
[36] Quoted by Leonard David, *Experts Say Path Beyond Earth Orbit Has its Challenges,* Space News (29 November 2004), http://www.space.com/spacenews/businessmonday_041129.html

interests in maintaining a deliberate, well tried strategy to maintain the current status quo rather than adopt newer emerging strategies.

The US is protective of its space industry. It has encouraged and has put in place measures to ensure that space technology does not transfer to states that could use it to develop a military space capability to challenge the US. The ITAR regulations were put in place to prevent the traffic in Arms generally but are particularly stringent where space-related technology is concerned. These regulations have proved so constraining that they have served to isolate the US space industry, deny them effective access to global markets and encouraged the development of competing markets outside the US. The result is that whilst the US space industry continues to dominate in many areas, it is now under increasing pressure from emerging markets and is constrained in its response by the ITAR regulations and discouraged by a corpulent internal market.

Legal Governance and Political Leadership in Space

Space has posed two of the overarching international problems of the twentieth century: how to contain expensive arms races despite bitter competition and distrust, and how to manage the use of non-territorial regions like the sea, air, Antarctica, or outer space, within the system of sovereign, territorial states. Containment of the expense of the arms race is beyond the scope of this paper and will not be addressed. The use of non-territorial regions continues to stretch the boundaries of the limited number of treaties

and international law that have grown to codify the rapid exploration of outer space over the past 50 years.

The Space Age spawned inquiry into the fundamental principles that should guide the actions of nations outside the Earth. As technology advances and more states and non-state actors have an increasingly valuable stake in this celestial environment, the more important cooperation becomes but the more difficult agreement is in the tension between a Hobbesian struggle for power and dominance and the Kantian desire for an international community in space with common universalistic goals. Codification of the law relating to space is still embryonic in its development by comparison to the Law of Armed Conflict - even the definition of the boundaries of space remains unclear today[37]. The core of the jus ad bellum spatialis and the jus in bello spatialis can be found in five multilateral treaties that provide the limited framework of international law governing the use of force in outer space.

At the heart of these treaties, often referred to as the Magna Carta of outer space, is the 1967 *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies* – in common parlance, the Outer Space Treaty[38]. Born out of an unusual degree of cooperation between the US and the

[37] Defining the boundary between the atmosphere and space has proved particularly problematic and has been left undefined in existing space treaties. The points where land, sea and air (essentially solid, liquid and vapour) begin are clearly visible and any areas of uncertainty have been defined sufficiently well in the vast majority of cases. Space lacks such a clearly definable boundary but the need for further clarity has yet to arise – although technology is begging more and more questions as hypersonic aircraft and high-altitude unpiloted vehicles blur the boundary between traditional air and space vehicles.
[38] United Nations Treaties and Principles on Outer Space, (United Nations, New York, 2002), pp1-56.

Soviets, the Outer Space Treaty proclaims the lofty principle of "peaceful use" of space. Unlike the continents newly discovered by the Europeans from the 16th to the 19th centuries, "outer space, including the moon and other celestial bodies, is not subject to national appropriation"[39]. The "peaceful uses" rubric applies to the moon and other celestial bodies but is never defined in the treaty and has allowed a generous interpretation that is now generally understood to mean the 'non-aggressive' use of space. This has accommodated the passive use of military reconnaissance and communications satellites that have contributed to greater transparency between states leading to a higher level of treaty verification and resultant confidence. The four other treaties deal specifically with some of the concepts included in the 1967 Outer Space Treaty, such as the rescue of astronauts, liability for damage caused by space objects and the registration of objects in space. The two main space protagonists in the drafting of the Outer Space Treaty, the US and the Soviet Union, were surprisingly in accord with the thrust of the Outer Space Treaty. Both had witnessed the collateral effects of high altitude nuclear explosions during tests. For example, the US *Starfish Prime* High Altitude nuclear test which took place 400Km above Johnson Island in the Pacific on 9 July 1962 generated an Electro Magnetic Pulse which not only damaged TV sets in Hawaii 300 miles away but damaged seven satellites over a period of seven months and continued to affect the Van Allen belts until the 1970s[40]. One of the satellite casualties of the *Starfish* test was the first commercial communication satellite ever, the US

[39] Abram Chayes, Antonia Handler Chayes and Eliot Spitzer, *Space Weapons: The Legal Context,* in Franklin A. Long, Donald Hafner, and Jeffrey Boutwell (eds), *Weapons in Space,* (W. W. Norton and Company, 1986), p195.
[40] Michael E. H'Hanlon, *Neither Star Wars Nor Sanctuary: Constraining the Military Uses of Space,* (Brookings Institution Press, Washington DC, 2004), p69.

Telstar. As a result of the experience of this and other tests, both the Soviet Union and the US were determined that there should be no nuclear weapons in space to ensure the environment was secure and available for their own ends and for future exploitation. From the US perspective, the Outer Space Treaty has been regarded as the offspring of two abiding American mentalities. The first mentality was a Wilsonian emphasis stressing liberalism and the rule of law in an attempt to shrink the arena of conflict and mistrust between the Superpowers. The second mentality could be regarded as Hoovarian, stressing engineering and material prosperity – unbridled growth through access to a new and exciting frontier[41]. The experience of the Soviets and the Americans was, in part, responsible for the development of one of the first space power theories – space as a strategic sanctuary.

As the space age dawned and the Cold War deepened, there was tangible concern over how the Soviet Union would react to overflight of its territory from space. The 1944 Chicago Convention on Civil Aviation affirmed national sovereignty; it also promoted the right of innocent passage but the Soviet Union never adhered to it and insisted that "the air space above land is as much territory of the state as the land itself" and it is doubtful they would have accepted any vertical limitation to that claim. Such a secretive nation would undoubtedly see American satellite reconnaissance as an attack upon that closely guarded secrecy and consequently 'illegal' and may even have construed such an orbital pass as an act of aggression. This point was astutely made in a RAND report in 1950 which suggested that the "Fear of

[41] Walter A. McDougall, *The Heavens and the Earth,* p420.

loss of secrecy is constant and intense. A picture of the outside world as engaged in penetrating Soviet secrets is likely to be highly anxiety-provoking"[42]. Fear of exposing the empty claims of missile superiority made by Khrushchev certainly played a part in the Soviet desire to avoid overflight of their territory.

The main vector of disagreement between these two great powers in the formulation of the Outer Space Treaty related to the use of space for reconnaissance, or spying. The risks taken to spy on an adversary were significant and the shooting down of the US U-2 spy plane over Sverdlovsk on 1 May 1960 was a prime example. Flying over hostile territory, each mission could be regarded as a hostile act by the Soviets and so required Presidential sanction. President Eisenhower was reported never to have found taking the decision to authorise these flights particularly easy and had twice imposed a moratorium because of concerns that the missions were too provocative[43]. The impact of the shoot-down of the Gary Powers U-2 on the eve of the long-awaited superpower summit in Paris could not have been greater. The opportunity to achieve the levels of verification obtained by the U-2 spy missions without resorting to such risky means was something that the US desired to obtain information on Soviet capability and significantly reduce the risk of the Cold War turning hot because of any misperception.

[42] Kecskemeti P, *The Satellite Rocket Vehicle: Political and Psychological Problems,* (RAND RM-567, 4 October 1950), p5, 9 and 10.
[43] Aleksander Fursenko and Timothy Naftali, *Khrushchev's Cold War,* (W. W. Norton & Company, New York, 2006), p267.

The legality and reaction to overflight of the Soviet Union by a satellite was conveniently diffused in October 1957 when *Sputnik I* was launched into orbit. That the US could have orbited a satellite using the Redstone rocket many months earlier had they not tried to be so open and inclusive in the International Geophysical Year of 1957 or prevaricated over the legality of space overflight was made clear by Secretary Donald Quarles in a meeting with President Eisenhower on 8 October 1957. At the meeting, Secretary Quarles declared that "the Redstone, had it been used, could have orbited a satellite a year or more ago" but that "it was better to have the earth satellite proceed separately from military development. One reason was to stress the peaceful character of the effort; the second was to avoid the inclusion of material, to which foreign scientists might be given access"[44]. Secretary Quarles balanced the loss of prestige involved by highlighting that the "Russians have in fact done us a good turn, unintentionally, in establishing the concept of freedom of international space"[45]. This was reflected in the Soviet retreat from its original position of unlimited vertical sovereignty and the acceptance of the 'freedom of space'. The argument used to support the retreat was sublime in its logic; Sputnik did not violate sovereignty because it did not fly *over* countries below, rather the countries themselves rotated beneath the Sputnik! Regardless of the 'spin', space was now considered analogous to the high seas, beyond the "effective control" of governments[46].

[44] Even in the early years of the Space Age, the US was fearful of the technology which gave them the lead proliferating to other countries. Often, these other countries were friendly nations such as the UK.
[45] "Memorandum of conference with the President" (October 8, 1957, 8:30 AM), DDE Library www.eisenhower.utexas.edu/dl/Sputnik/MemoofConferencewithPresidentOct819571page.pdf
[46] Zadorozhnyi G, *The Artificial Satellite and International Law,* Sovetskaia Rossiia (17 October 1957), in U.S. Senate, *Legal Problems of Space Exploration,* pp 1047-49, in Walter A. McDougall, *The Heavens and the Earth,* p258.

CHAPTER 3

The Soviet Challenge – How America Responded to Win the Space Race

'Soviet Satellite Sends US into a Tizzy'

LIFE 1957[47]

The debate over whether to enter a space race with the Soviet Union or not was a deeply considered one and it was won not on logic, a need for national security, military requirement, technical necessity or commercial opportunity but on the American desire to build and safeguard the worldwide perception of the American nation as technologically pre-eminent. The political symbolism of the Space Age was neatly captured at a dinner following a meeting of the Greenewalt Committee[48] on 10 December 1959 by the then Vice President Nixon. He précised the debate that had occurred between the 'space racers', who were keen to commit to a technological space race for prestige, and the 'science group' a more conservative group who were concerned that any ensuing race would be to the detriment of other practical experimentation. The gathering of 'outsiders' that formed the committee listened as Nixon described how he recognized that politics had to rank higher than science and that space had captured the imagination of the world, indicating power and prestige and so trumped the pure science argument. The crushing impact on the American psyche and loss of national prestige, which would result if the US did not respond to the challenge thrown down by Russia (with the success of *Sputnik I)* was politically untenable. Nixon was sagacious enough to recognize that there might be preferable

[47] 'Soviet Satellite Sends US Into a Tizzy', LIFE, 21 October 1957, p2.
[48] The Greenewalt Committee was formed by Thomas Glennan (the first NASA Administrator) and his deputy Hugh Dryden from a group of 'outsiders' to examine the significance of competition with the Soviets for space leadership as a determinant of the magnitude, scope and urgency of US non-military space efforts.

'crusades' to pursue but none were more important than the symbolism of space and its potential political impact on the Cold War[49].

The Challenge Accepted and the Beginning of the Race to the Moon

So it was that the Space Race was entered, regardless of its merits. The decision was sealed with the approval, by President Eisenhower, of NSC-5918, *US Policy on Outer Space* on 12 January, 1960. In that policy, the imposing challenge presented by outer space was identified and it was made clear that:

> There are important scientific, civil, military and political implications for the national security, including the psychological impact of outer space activities which is of broad significance to national prestige.

Although most opinion considered the US the leader in general technological accomplishments, the policy also acknowledged that "the USSR is viewed in most quarters as leading in space science and technology" and as a consequence even the Soviets' "baldest propaganda claims are now apt to be accepted at face value, not only abroad but in the United States". It was expected that the US would "catch up" by demonstrably equalling or beating the Soviet accomplishments. Failure to do so would lose the Space Race and would give rise to the belief that the United States is "second best," thus transferring to the Soviets additional increments of prestige and credibility now enjoyed by the United States."[50]

---

[49] Walter A. McDougall, *The Heavens and the Earth*, p204.
[50] National Aeronautics and Space Council. NSC 5918/1. *Draft Statement of US Policy on Outer Space,* Dwight D. Eisenhower Presidential Library and Museum (17 December, 1959), p1 and 2.

Such was the public profile of the Space Race that it dominated the 1960 Presidential election campaign. It became a metaphor for the kaleidoscope of challenges facing the US at home and abroad and was captured by each of the candidates. Kennedy in his speech in Portland, Oregon of 7 September 1960[51] explained how:

> The people of the world respect achievement. For most of the twentieth century they admired American science and American education, which was second to none. But they are not at all certain about which way the future lies. The first vehicle in outer space was Sputnik, not Vanguard. The first country to place its national emblem on the moon was the Soviet Union, not the United States. The first canine passengers in space who safely returned were named Strelka and Belka, not Rover or Fido, or even Checkers.[52]

Nixon similarly pledged that under his administration, the US would be second to none in space[53]. The accomplishment of the Soviet Union and the subsequent Space Race it spawned was the catalyst for the US to revamp everything from its Army to its education system to generate the engineers necessary to win the race. Military doctrine was re-written and economic possibilities previously undreamed of were opened up. In peace time, the military has to fight for each dollar it spends, justifying the requirement whilst the appropriations committees decide the merit of each of the budget submissions. In war, however, a rapid transition occurs. The dollar loses its significance and the focus is on prosecuting the war as quickly and effectively as possible to win rapidly and to avoid casualties, damage to the national infrastructure and to the economy. The Space Race was no different to war. According to James Webb, the NASA Chief tasked with organizing the

[51] Cited in Walter A. McDougall, *The Heavens and the Earth,* pp221-222.
[52] 'Checkers' was the name of Nixon's dog.
[53] Cited in Walter A. McDougall, *The Heavens and the Earth,* pp221-222.

expedition to the moon, the space programme required nothing less than the mobilization of the nation to a war footing in peacetime, asserting that whether the US liked it or not, they were "in the midst of a crucial and total technological contest with the Soviet Union"[54]. The dollar lost its tangible significance in the race to the moon. Victory as rapidly as possible, or at least more rapidly than the Soviets, was more important to the nation and its sense of itself in the Cold War world.

So it was on 25 May 1961 that, the newly elected President Kennedy delivered to Congress his special message on urgent national needs. At the end of a long and detailed speech, he famously declared that the United States should:

> Commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to earth. No single space project in this period will be more impressive to mankind, or more important for the long-range exploration of space; and none will be so difficult or expensive to accomplish.

The speech not only acted as the catalyst for the US to commit to enter the Space Race, it was also a rallying call to all Americans in that "it will not be one man going to the moon … it will be an entire nation. For all of us must work to put him there". The commitment asked for should be total, there should be no half-measures for in the President's view "If we are to go only half way, or reduce our sights in the face of difficulty, in my judgement it would be better not to go at all". Finally his call to the nation demanded a commitment of:

[54] James E. Webb, *Space Age Management: The Large-scale Approach,* (McGraw-Hill Book Company, New York, 1969), p17.

> Scientific and technical manpower, material and facilities, and the possibility of their diversion from other important activities where they are already thinly spread. It means a degree of dedication, organization and discipline which have not always characterized our research and development efforts. It means we cannot afford undue work stoppages, inflated costs of material or talent, wasteful interagency rivalries, or a high turnover of key personnel.

In short it was a rallying call for a battle of prestige, fought in the full knowledge of the heavy costs it would incur but a battle that would have a deciding influence on the outcome in a total Cold War[55].

The 'Kennedy Effect' was just the fillip the nation needed and sparked the boom that realised the lunar goal. Swept along on this tide, the nation was encouraged to believe not only that it could send men to the moon but, in true American exceptionalism style, they were convinced they could resist communist expansion, promote development abroad and reach any goal. The Kennedy goal encouraged Congress and the nation to believe that Apollo was the space programme. Once it was over and Apollo had landed, Americans began to turn back to furnishing their own self-interest[56]. This sentiment continued into today as more contemporary goals in space-based technology lost their direction and impetus. Apollo was about going to the moon and building whatever technology could get America there; the Space Shuttle was a matter of building a technology and going wherever it could take America[57].

---

[55] President John F. Kennedy, *Special Message to the Congress on Urgent National Needs,* John F. Kennedy Presidential Library and Museum, http://www.jfklibrary.org/Historical+Resources/Archives/Reference+Desk/Speeches/JFK/Urgent+National+Needs+Page+4.htm

[56] Richard S. Lewis, *The Kennedy Effect,* Bulletin of the Atomic Scientists (March 1968), pp2-5.

[57] Walter A. McDougall, *The Heavens and the Earth,* p423.

Realising the Goal and Mobilising the Nation

The technology the US employed to reach the lunar goal set by Kennedy has been well documented. In terms of better understanding how the nation was mobilised, a focus on perception and on who piloted the Kennedy goal to its conclusion and victory in the Space Race will be the emphasis. The US was in the business of selling an image and it was the images that replaced ideals – dishwashers and televisions, consumerism and technology were the arsenal of the American assault on the semiotic perception of world opinion in the battle of prestige with the Soviet Union and in the definition of their own identity. It is no accident that the US – the most technologically advanced nation in the world – was also the most advanced nation in advertising. The US was well armed in the battle of symbolism which had become the lingua franca of the technocratic Space Age. As well as being well served in being able to translate and sell the message to the nation and the wider world, the US was also blessed with a cohort of decision-makers in power who would be entrusted with the responsibility for translating the goal of sending a man to the moon and safely returning him to Earth into reality and realising the prestige it bestowed. This cohort of powerful men had been shaped by their experiences during the totality of WWII. It is recognized that a person's most influential and formative memories are those they experience at first-hand which have major consequences for themselves, their career and their nation. The decision makers in Washington and in the embryonic NASA had witnessed the effect of mobilising the state to

accelerate advances in science and technology, in transferring that technology to industry and in the willingness of the American people to rally to a common unifying cause[58].

The fact that these lessons had been learned first-hand generated disproportionate impressions. Reading about the lessons of great wars or learning from another states' experience may offer the best lessons but they are rarely the most influential or deeply ingrained[59]. It has been persuasively argued that the influence of major contemporary wars on learning have a much greater salience. It has also been demonstrated that the longer the event dominated the political climate, the wider the ruling age-band is and the greater the impact. The two World Wars influenced later beliefs not only because they were highly salient but because they held attention over many years. The lessons thus became deeply embedded, and successive groups learned the same beliefs. So it was that a whole generation of decision makers in the US administration of the 1960s had undergone a common, first-hand experience during WWII which provided a shared formative reference point that was to prove a unifying bond that they used to great effect in mobilising the American nation[60]. The perceptual predisposition to rally behind a cause and the practical confidence to trust in the ability of science and technology to rise to the occasion, the power of industry to meet

[58] For instance, Robert McNamara the US Secretary of Defense from 1961 to 1968 took his experience of studying the efficiency of General Curtis Le May's B-29s to the Ford Motor Company where he became one of the "Whizz kids" who used his formative military experience to supervise the regeneration of the company.
[59] The US paid scant regard to the crippling losses experienced by British unescorted daylight bombers during the WWII until the Americans themselves began similar unescorted daylight bombing raids and attracted comparable losses. Only then was the need for fighter escort was accepted.
[60] Robert Jervis, *Perception and Misperception in International Politics,* (Princeton University Press, 1976), pp216-287.

demanding timescales and rapidly rising capacity all contributed to the translation of President Kennedy's vision and goal being turned into reality. The salience and impact of the momentous experiences that the War had on these men of action was a notable ingredient in the launching and eventual success of America in winning the Space Race. The country and these men, from all shades of the political spectrum, had a new unifying cause to rally behind and they unambiguously embraced the battle identified by Kennedy – it was a battle of prestige in a race for the moon.

The Soviet Experience and Mr Khrushchev's Boomerang

What did the Soviets gain from the Space Race? Certainly *Sputnik 1* presented Khrushchev with a propaganda coup demonstrating the apparent technological and economic superiority of the Soviet system but it also reinforced the claim (later proved not to be true) that Moscow had an ICBM capability and significant numbers of them. The credibility given to Soviet missile claims by the achievements embodied in *Sputnik I* was recognised in NSC 5918/1 which identified that

> From the political and psychological standpoint the most significant factor of Soviet space accomplishments is that they have produced new credibility for Soviet statements and claims[61].

The secrecy of the work of Korolev[62] allowed Khrushchev to take the plaudits as the leading inspiration behind the Soviet leap into space. The spectacular

[61] National Aeronautics and Space Council NSC 5918/1, *Draft Statement of US Policy on Outer Space,* Dwight D. Eisenhower Presidential Library and Museum (17 December, 1959), p1.
[62] Sergey Pavlovavich Korolev was the head Soviet rocket engineer and designer, later identified as the enigmatic Soviet 'Chief Designer' and driving force behind the Soviet space programme.

space ‘firsts’ also served to enhance the image Khrushchev wanted to foster of himself as a dynamic leader. The rewards garnered in the international boasting that followed the success of *Sputnik I* would not be easily surrendered. The subsequent *Lunik* launch reinforced the perceived lead that the Soviets peddled and spurred President Eisenhower to consider competing with the Soviets on grounds of national prestige. Three years after *Sputnik I*, the US was still perceived to be lagging behind. The perception of Soviet technological might was further heightened in April 1961 with the launch of Yuri Gregarin into orbit on Korolev’s powerful and majestic *Vostok I* rocket. Although the US achieved a sub-orbital trajectory three weeks later, it did nothing to close the apparent gap that existed in the eyes of the world. In actuality, the Americans were leading the Soviets in every meaningful category of missile technology but despite this the perception to the contrary persisted because of the high profile propaganda achievements gained by the Soviets.

John Foster Dulles was one of the first to realise that the prestigious gains from Sputnik and its successors would return to haunt the Soviets and become “Mr Khrushchev’s boomerang”[63]. Indeed he proved to be correct. The discontinuous jolt that *Sputnik* provided to the US put into stark contrast the prospect of being perceived as also-rans in space and was sufficient to shock the US into a technological and economic frenzy that ultimately left the Soviets ‘in a spin’. If Eisenhower was guilty of underestimating the importance of *Sputnik*, Khrushchev was equally guilty of overestimating its

[63] Quoted in Walter A. McDougall, *The Heavens and the Earth,* p295.

importance. Where the US was able to use the first satellite as a catalyst to energise a nation, the Soviets were not able to use it as a similar catalyst for a system resistant to change and a command economy unable to match the agility and dynamism of the western liberal capitalist model. The first space challenge posed by the Soviet *Sputnik* was won not in space but in the will of the US to be the 'shining beacon on a hill', demonstrating to the Soviets and to the world, the virility and dominance of the American way.

Reagan's Space Race

As a footnote to the account of the first challenge to American technocracy, the gauntlet of the second challenge between the US and the Soviet Union was laid down by the Americans. President Reagan emulated Kennedy by calling for a further space race in the 1980s as a means of breaking the Soviet ability to match the dynamism and energy of the US technical capability, again focused on space. For the first time in 1981, military space budgets surpassed those of NASA and Reagan's Strategic Defence Initiative (SDI) was at the source of this increase. SDI, dubbed "Star Wars", had exotic plans for space-based missile defence which shattered the brittle doctrine of space as a sanctuary and triggered a global debate on the impact on deterrence and the concept of assured destruction. The Reagan initiative was successful in accelerating the Space Race to such a degree that the Soviet system was unable to keep pace and eventually faced defeat. This was exactly what Reagan was aiming for, asserting that "capitalism had given us a powerful weapon in our battle against Communism – money. The

Russians could never win the arms race; we could outspend them forever."[64]

So it was that on these two occasions that it was the sense of exceptionalism, high ideals and economic might that saw the US through to victory.

[64] Reagan, *An American Life,* p267, in John Lewis Gaddis, *Strategies of Containment,* (Oxford University Press, 2005), p351.

CHAPTER 4

US Grand Strategic Approaches

While the United States will constantly strive to enlist the support of the international community, we will not hesitate to act alone.

President George W. Bush[65]

The US has emerged from the Cold War and the parallel Space Race as the dominant nation militarily, economically and technologically. It was also, by some margin, the most dominant nation in space. From 1989 to 2001, American policymakers searched for the rationale to focus the country's role in the absence of any single unambiguous challenge that might be the hub of a new grand strategy, both generally and in space. The terrorist attacks of 11 September 2001 brought this hiatus to an abrupt and shocking end and provided a definite focus for American national security. In addition, the mass murder and political intimidation of the terrorist attacks on the World Trade Centre and the Pentagon served to put in context the potential spectrum of asymmetric threat that the US space capability might face by a sub-state actor that wanted to reduce the US technical superiority. First, the scale and sophistication of the 9/11 attacks and the disregard for the loss of life suggests there would be no hesitation to use Weapons of Mass Destruction (WMD) if they were available to terrorists. Second, the willingness to sacrifice their own lives in the attack calls into question the precepts of deterrence. With the scope of threat so extensive, no option should be dismissed. One such outlandish event would be a high altitude

[65] President George W. Bush, *The National Security Strategy of the United States of America,* (17 September 2002), p6.

nuclear detonation which would have the potential of bringing the technologically dependant US and much of the developed world to a stand-still. Whilst such a scenario is not expected, nor is it proposed that it has been the catalyst for American actions, the intent could be envisaged, even if the capability does not yet exist. Whilst such a potential threat should not be dismissed, it is the more tangible and pressing challenge to American security posed by terrorism that capture the attention. It is the subsequent events in Iraq and Afghanistan and the intelligence effort in the so-called 'global war on terror' that have been the focus of American military and security activity. This security activity has drawn on the technologies enabled by space-based assets more than ever; reinforcing the importance that space plays in American military capability. Coupled with the security efforts, the characterisation of nations as "evil" and the goal of fostering democracy throughout the Middle East have exhibited a hubris that has served to galvanize a resentment and in some cases, opposition to American hegemonic power[66].

US Strategic Realism

Before considering the emerging challenges that the dominant US faces in space, it is helpful to reflect on the US strategic approach to provide some context against which the challenges can be better appreciated. The grand strategies considered are general in nature but are applied here with a strong view towards American attitudes and policies in space. Attentive to the

[66] Robert J. Lieber, *The American Era: Power and Strategy for the 21st Century,* (Cambridge University Press, New York, 2005), p13.

importance of power and the centrality of military force, the US has displayed many realist tendencies. The impotence of the UN to address many recent international crises has generated such a lack of confidence in the organization that, in effect, there is an absence of any credible central authority above the level of the state. This contemporary neorealist vacuum has left the world looking to the US to fill the gap at a time when the US feels more threatened and is looking to disengage from regional security alignments. Whilst still dominant across virtually all spheres, the over-commitment of the US and its desire to disengage has left the way open for a degree of economic balancing in the space industry and the rise to near technological parity in space by the likes of Europe and China. As a response to the unipolarity of *pax Americana*, a multilateral, liberal internationalist tide is rising in opposition to US dominance, particularly in space. The increasing reliance on global governance to address common issues, such as the creation of the International Criminal Court and the Kyoto Treaty on global warning is spreading to the space arena with repeated proposals at the UN Conference on Disarmament for a Treaty on the Prevention of an Arms Race in Outer Space (PAROS). Such multilateralism, particularly where space is concerned, seem to carry a thread of altruism that is seductive but when viewed against the national self-interest of many of the states proposing this liberal path, the veneer is peeled to reveal core realist tendencies[67].

[67] For example, the Chinese ASAT test of 11 January 2007 would have contravened the spirit if not the letter of the PAROS Treaty repeatedly supported by China.

US Grand Strategy – The Rise to Primacy

With these contextual descriptions established, what would best describe the US grand strategy? A definition of the term grand strategy that captures its main elements describes it as the means by which "a country will employ the various tools it possesses – military, economic, political, technological, ideological and cultural – to protect its overall security, values and national interests"[68]. Many grand strategies have been postulated but a look at four previously described visions of US grand strategy comprising neo-isolationism, selective engagement, cooperative strategy and primacy will provide the framework here[69].

The desire for neo-isolationism is apparent in the growing calls for disengagement and the lack of any rational, all-embracing challenge to US dominance. However, the events of 9/11, the integrated nature of the global economy and the worldwide impact of environmental issues all detract from this as a viable strategy. Furthermore, the disengagement of the US from the global stage would create a vacuum that would likely precipitate greater competition and offer more opportunities for space proliferation.

A strategy of selective engagement would serve to concentrate power with an assortment of states that would form a wedge of interest to deter

[68] Robert J. Lieber, *The American Era: Power and Strategy for the 21st Century,* (Cambridge University Press, New York, 2005), p40.
[69] Barry R. Posen and Andrew L. Ross, *Competing Visions for US Grand Strategy,* International Security, (Vol. 21, No.3, Winter, 1996-1997), pp5-53.

others has some merit. Given the many competing demands on US resources, this strategy offers the opportunity of spreading the burden among a group of allies that would provide a stabilising balance and powerful alignment. Whether US prestige could bear the dilution of reputation and consequent loss of influence across other related spheres by sharing power is questionable. Nor does this strategy chime with the US propensity to want to determine its own focus for foreign policy or act as the 'shining beacon on a hill'. The US is a natural leader, generally and in all things related to space, a strategy of selective engagement would require it to cede this leadership, not something the US is inclined to do.

Cooperative engagement has some attractive elements too but lacks the independence and romance of a grand strategy that would appeal to the sense of US exceptionalism. Neo-isolationism and selective engagement have their roots in the realist school. The strategy of cooperative engagement, by contrast, has its roots in the liberalist school. Collective action among democratic nations using international institutions where possible is seen as the way to deter aggression and the challenges of such collective security are ameliorated by the lesser demands of cooperative security. The growing number and influence of democratic states cooperating within established international institutions would leave remaining 'rogue' states isolated and prone to intimidation by the collective influence of the coalition. Whilst seductive, this liberal approach is vulnerable to a range of criticism some of which was alluded to earlier. Expectations that nations would rise above narrow conceptions of national self-interest on behalf of the

collective good has always been a weakness of cooperative approaches. Whilst this remains the case, space has often proved to be an environment where both the collective good and national self-interest have been synonymous. For example, the UN Committee on the Peaceful Uses of Outer Space (COPUOS) agreed debris mitigation guidelines which have served to slow the growth of debris in space, lessening the risk of damage from debris and benefiting all space-faring nations[70]. However, building sufficient multilateral agreement on other important space-related issues, such as weaponization of space, has not been achievable, even among partners who are close in many other respects. For example Europe has insisted on an independent alternative to GPS, the Galileo precision navigation and timing constellation. This has caused friction with the US not least because of the potential frequency confliction of the Galileo system with the secure 'M' code of GPS. Europe is also looking to further its own economic self-interest by generating revenue from the potential down-stream services from Galileo[71]. Despite many areas of cooperation, a more formal strategy of cooperative security remains elusive and far from an aspiration of the US[72].

Finally, the grand strategy of primacy is considered. Arguably, the US has not only been *primus inter pares* but *primus solus* since the end of the Cold War, not only preserving peace among the major powers but securing supremacy economically, militarily and technologically. Such dominance across all spheres has prevented the emergence of any rival and has been

[70] Spacesecurity.org, *Space Security 2006,* p39.
[71] A common European road taxing scheme where each car is taxed dependant on the roads it travels on across Europe would be possible if Galileo receivers were mandated in all cars.
[72] Major General James Armor, *Director, National Security Space Organisation,* in discussion with the author, 12 June 2007.

the focus of recent US strategy[73]. In addition the US has exerted significant "soft power", dominating mass culture, news media, film and television[74]. Though committed to the maintenance of overwhelming power and influence, the US also remains strongly committed to liberal principles, assuming the role of a benign hegemon. To sustain this primacy requires the US to pursue a level of qualitative superiority over all potential challengers to discourage competition. Whilst this was feasible prior to 9/11, the subsequent national security imperatives have stretched even the resources of the US and the budgets are no longer available to meet the goals of space leadership stated in the latest 2006 Space Policy[75]. In addition, the quest for primacy faces a number of other challenges. Some states will not wish to remain in a permanent position of subordination to the US, for many reasons not least of which will be national pride, and nor will an open liberal economy serve to encourage such subordination. The arrogance of an insistence on hegemonic primacy by the US can in itself engender resistance. The US has demonstrated willingness for preparatory self-defence that has stretched to pre-emption in an attempt to thwart rising challengers, particularly ones that may have access to WMD. This latter point was certainly evident in the so-called 'Bush Doctrine' captured in the 2002 *National Security Strategy of the United States*, declaring that "America will act against such emerging threats before they are fully formed"[76]. For the first time it proclaimed the national

[73] *Excerpts from Pentagon's Plan: 'Prevent the Emergence of a New Rival',* (New York Times, 8 March 1992), p14, cited in Barry R. Posen and Andrew L. Ross, *Competing Visions for US Grand Strategy,* International Security, (Vol. 21, No.3, Winter, 1996-1997), p33.
[74] Joseph S. Nye and William A. Owens, *America's Information Edge,* Foreign Affairs (Vol. 75, 1996), pp 20-36.
[75] Major General James Armor, *Director, National Security Space Organisation,* in discussion with the author, 12 June 2007.
[76] President George W. Bush, *The National Security Strategy of the United States,* (17 September 2002), p2.

security objectives which included: preemptive military action against hostile states and terrorist groups seeking to develop WMD, an unwillingness to allow its global military strength to be challenged by any hostile power and, in contrast to the primacy emphasis of the previous two statements, it did express a commitment to multilateral international cooperation. The main thrust was one of primacy and the ambition it contained reflects the final critique of a strategy of primacy; namely the dangers of imperial overstretch. Robert Jervis cautioned against this, warning that "avoiding this imperial temptation will be the greatest challenge that the United States faces"[77]. Whilst the US seems in many ways ideally endowed, economically, militarily and politically, to run a benign liberal empire, in practice it has not found it easy. Such imperial undertakings are often short-lived and their results ephemeral[78].

Anti-American Backlash

The US has followed a general strategy of global primacy as a benign hegemon and it has been successful and drawn considerable admiration. However, whilst on this path, the US has also drawn opprobrium and resentment. A striking example of these contradictions is to be found in the actions of one of the most influential Sunni Islam clerics; the Qatar-based Sheik Yusuf al-Qaradawi. Widely condemning the US in the media, comparing US actions in Iraq with the invading Mongols of 1258 who sacked

[77] Robert Jervis, *Understanding the Bush Doctrine,* in Demetrios James, Caraley, ed, *American Hegemony: Preventive War, Iraq, and Imposing Democracy* (New York, Academy of Political Science, 2004), p26.
[78] Niall Ferguson, *The Rise and Fall of the American Empire,* (Penguin Books, 2004). p2.

the city of Baghdad and slaughtered the inhabitants, al-Qaradawi has been a colourful and outspoken critic of us foreign policy and culture. Such outspoken dislike of the US, however, is not matched by a principled personal conviction. He sent his daughter to the University of Texas for a graduate degree in biology, his son for a doctorate at the University of Central Florida and another son for an MBA degree at the American University of Cairo[79]. The contradiction is, however, indicative of the 'love-hate' relationship the US experiences. The demand for 'global governance' is outstretching even the prodigious capacity of the US. Such contrasting and contradictory views of the US are not uncommon. In addition, the US preponderance across all spheres has fostered a view which attributes the US with omnipotence and omniscience. As a consequence, the US is often blamed for events in the world as if they were planned or willed by Washington[80]. The National Security Strategy of 2002 has its critics[81] whilst others have provided a more positive analysis[82] but the strategy, right or wrong, was one deemed best for the US at the time. Whether the demands of primacy have overstretched the US generally is open to debate, whether this overstretch and concern over threats has led to the emergence of challenges in space is even less certain. Indicators of balancing by states are beginning to emerge with China committing to serious increases in defence spending (particularly in space) and there is also evidence of the creation of new alliances – generally as well as in space. In a world where the demand for 'global governance' greatly

[79] Fouad Ajami, *The Falseness of Anti-Americanism,* Foreign Policy, (No. 138, September-October 2003), pp52-53.
[80] Robert J, Lieber, *The American Era,* p185.
[81] Robert Jervis, *Understanding the Bush Doctrine,* Political Science Quarterly, (118, No. 3, 2003), pp365-388.
[82] John Lewis Gaddis, *A Grand Strategy of Transformation,* Foreign Policy, (No. 133, November/December 2002), pp50/57.

exceeds the supply, it is the US that the world continues to turn to. Whether it can or has the will to continue to meet these calls remains to be seen. Whether it sees or has the capacity to meet the challenges to its space dominance is related and will determine whether the US retains its leadership in space or cedes it.

These grand strategies provide the context against which the US space challenge should be viewed. The American desire to act as the 'beacon on the hill', living in a society driving technology relentlessly forward is revealed in the hubris of the strategy of primacy. As in the modern mythology of George Orwell's *1984* or Aldous Huxley's *Brave New World*, total dominance has frequently resulted in total power that, even if benignly intended, ends up becoming the undoing of the society[83]. It is not to suggest that the US primacy is quite as overwhelming as these modern fictional examples but the lesson of overstretch and a system that attempts to wield too much power is evident and is one that the US should pay heed to.

[83] Walter A. McDougall, *The Heavens and the Earth,* p447.

CHAPTER 5

Challenges to American Leadership and Dominance in Space

It's nice to say we can do it unilaterally, except you can't

Secretary of State Colin Powell[84]

Over the 50 years of spaceflight, much of the superpower competition of the Cold War has given way to international cooperation among a growing number of space-faring nations. The merger of the US and Soviet space programmes into the International Space Station is a wonderful example of cooperation on one of the most outstanding engineering achievements of the space age. Cooperation is also evident in commercial spaceflight with multinational corporations investing billions of dollars in communications satellites of staggering capacity. This cooperation is to be welcomed but it remains a veneer over the anarchic world of state security. In reality, the need to secure the advantages accrued from the high ground of space will continue to play a significant part in the security of any sovereign state.

In response to the Soviet challenge to US technocratic dominance at the heart of the Space Race, public opinion and support played an important part in delivering the nation's space aims. Public support for cooperative space ventures has continued to play an important part in selling the expenditure and commitment to space. In the background the real expenditure and commitment to the classified and secretive military and intelligence space programmes takes place deep within the Department of

[84] Secretary of State Colin Powell to President George W. Bush, quoted in Bob Woodward, *Bush at War,* (Simon and Schuster, New York, 2002), p333.

Defense and other even more opaque organizations, far from public scrutiny. The aim of many of these programmes is far from the public stance of increased cooperation. Whilst it would be disingenuous to suggest that there was any lack of faith on the part of the US administration in their stated desire for cooperation in space in pursuit of dearly held values of freedom, exploration, discovery and the peaceful use of the new frontier in space, the duality of the parallel classified space programme does sit uncomfortably with this cooperative view. National prestige, the need for reconnaissance and for verification of activity deep inside Soviet borders presented an inescapable reality that required a response. Rather than bowing to the singular real challenge and responding in military kind, the US strove to pursue the twin approaches of ‘space for peace’ in the public propaganda campaign whilst also engaging in the realpolitik requirement to defeat their Cold War rival in this new and pivotal environment of space through military dominance. In doing so, the US paid a heavy bureaucratic and economic price by having the civil NASA programme designing national prestige projects and in its shadow running the military programmes in ICBMs, missile defence, in surveillance and in reconnaissance. The benefit accrued in this posture was a global moral dominance that served them well at the time. Whether this will continue to be the case is a moot point.

The US faces a number of challenges. Some are acute, demanding immediate responses; others are more obtuse and require delicate handling over a protracted period. The rise of China as the dominant peer rival is the most obvious challenge the US faces. The associated rise in the economic,

technical and commercial challenges to US dominance in the space industry is less apparent but of national importance to Washington. The final challenge is wrapped up in how space should be governed and administered. The two opposing views on space governance comprise the paradoxical liberal institutional view of Russia and China who have advocated further treaties and formal legal frameworks at the UN Conference on Disarmament or the US proclivity for more realist, less formal 'rules of the road' to govern activity in space.

There are other challenges than those faced in space that the American nation should be concerned with. Those other challenges which are capturing the political headlines such as the so-called 'global war on terror' and emerging challenges to do with climate change are important but without the technology furnished from the American lead in space, many of these other challenges would become even more difficult to tackle by an order of magnitude. The space challenges faced by the US from China, from commercial competition and from the management and governance of the space environment, will be considered in turn and some of the impact and potential responses considered.

Space Power Challengers

The challenges to US dominance in space come from a variety of states. The number of space-faring nations is growing rapidly. Forty four states have accessed space independently or with the launch services of

others[85] and states with their own space capability now numbers around seven[86]. The commercial sector is also growing rapidly but whilst now vast, it remains diffuse in terms of a direct challenge to US national capability. The most direct challenge from other states come from Europe (regarded as a state in this instance), Russia, India and, most pointedly, China.

Some have argued that Europe will soon emerge as a counterbalance to the US dominance in space. Europe has been a significant space power for a number of years and claims to have 40% of the commercial markets for satellite manufacturing launch and satellite services[87]. Clearly presenting a commercial challenge, Europe represents less of a security challenge. Despite the European Commission unveiling a plan to spend more than $5 Billion on "Security and Space" programmes between 2006 and 2013[88], it currently lacks unity in its security policy and the shared political institutions, differences among the member nations and competing budgetary priorities generally preclude any significant security challenge emerging[89]. Whilst Europe has a rapidly growing space sector and has ambitions to extend the capability it has developed in its civil applications into the security sphere, the liberal democratic principles shared by Europe and the US suggest any military conflict is highly unlikely. Consequently, the European security challenge will not be considered further here. Russia still retains a

[85] Spacesecurity.org, *Space Security 2006*, (Canada, July 2006), p16.
[86] The US, Russia, Europe, India, Japan, China and Israel have all launched satellites using organic national launch capability; Iran is on the cusp of this achievement and many other countries have satellites in orbit launched from one of these countries.
[87] Communication from the Commission to the Council and the European Parliament (COM(2007) 212), *European Space Policy,* Brussels, 26 April 2007, p4.
[88] Spacesecurity.org, *Space Security 2006*, (Canada, July 2006), p15.
[89] Robert J. Lieber, *The American Era: Power and Strategy for the 21st Century,* (Cambridge University Press, New York, 2005). P17.

considerable space capability and should not be dismissed as a security challenge to US dominance in space; its inventory of rockets, vestiges of the Soviet ICBM arsenal, remains significant and is turning out to be a valuable source of revenue after their conversion into commercial launch vehicles. US cooperation and engagement with Russia in space programmes has increased and so has reduced the potential misinterpretation of intentions typical of a security dilemma and so diminished the challenge posed. The US motives for this increased cooperation may be less than pure liberal altruism; for example, it is argued that the merging of the US and Russian manned space programmes towards cooperation on the International Space Station was largely motivated by the US desire to keep Russian rocket and missile engineers employed and off the international space job market thereby avoiding a migration of missile expertise to other states with missile ambitions[90]. Nevertheless, the cooperation and associated dialogue is beneficial and has led to greater transparency and trust between these two old Cold War nations[91]. The two most rapidly advancing space-faring nations to emerge as potential challengers to US dominance are India and China. The Indian President, Abdul Kalam, was among his country's space pioneers, helping to build and launch the continent's first rockets. Having such a space enthusiast at the Head of Government has certainly helped the Indian space programme blossom. Even with the ever-present tensions with Pakistan, the Indian space objective remains focused on the delivery of civil services such

[90] Joan Johnson-Freese, *Strategic Communication with China: What Message about Space?,* China Security (Issue Number 2, 2006), p45.
[91] The recent cooling off in relations between the US and Russia following the announcement by America that it intends to base BMD sensors and Ground-based Mid-course Defence (GMD) interceptors in Eastern Europe detracts from this dialogue but does not entirely undermine it.

as education, telemedicine and weather forecasting to its vast and remote population. India is definitely a rising space power with significant capability but one that is not at the top of the list of states which presents the clearest challenge to the US dominance in space and so will not be considered in any further depth in this paper.

The Chinese Challenge

Fifty years after Sputnik and the start of the original Space Race between the US and the Soviet Union, China is the one undertaking rapid and ambitious new developments in rocketry, satellite communications and space-defence and presents the clearest challenge to US dominance in space today. China recently joined Russia and the US as the only space powers with demonstrated manned spaceflight capabilities. In some of the futuristic US space war games, it is a nominal rising great power and near-peer space competitor, which could easily be taken for China, which occupies centre stage[92]. Played out on the fault lines that provide the context for real-world astropolitik, the US space war games focus on the US dependency on space assets both military and commercial and the recognition of the potential Achilles heel that this represents. The Games also factor in the globalization of commercial space services by multinational corporations operating partially outside the traditional jurisdiction of sovereign states and combine to generate the potential flash-points between the US and the near-peer, oriental rival. The unmistakable escalation of China as such a prominent space challenger

[92] MOD, Director of the Air Staff, Strategy Space, in discussion with the author, 18 April 2007.

is testament to the progress China has made in its space programme over the last half-century. Ironically, the rocket - 'firing arrow' in Chinese – was invented in China by Feng Jishen in 970 and its earliest recorded use in warfare dates back to the Song dynasty in their fight with Xia in 1083[93]. The genesis of the modern Chinese space programme can be traced back to its first director, a brilliant graduate of California Institute of Technology – Tsien Hsue-shen.

Graduating from CalTech in 1939, Tsien and five fellow students began to experiment with rocketry and their exploits quickly came to the attention of the US military. Tsien was also quick to gain considerable academic respect for his work, becoming CalTech's assistant professor of aeronautics in 1943. His commercial prowess was not found wanting either. He co-founded the highly successful Jet Propulsion Laboratory (JPL) and in May 1945 he was awarded the rank of Colonel in the US Air Force and sent to Germany to assess the Nazi V-2 rocketry of Wernher Von Braun. However, at the height of the McCarthy purges in 1951, Tsien was accused of being a communist, his security clearance revoked and he was arrested. In 1955 he was deported to China. The US loss was definitely a Chinese gain. Tsien's talent was quickly recognised and in October 1956 Tsien became the first Director of the Chinese defence ministry's Number 5 Research Industry – the Chinese Space Programme.

[93] Brian Harvey, *The Chinese Space Programme: From Conception to Future Capabilities,* (Praxis Publishing, 1998), p1.

From this US-endowed modern genesis, the Chinese space capability has made remarkable progress particularly when set against the attempted isolation of the Chinese space programme by the leading space-faring nation, the US. Whilst it may be convenient to assume that Chinese space technology has been acquired through 'beg, steal and borrow' methods, it is not entirely an accurate reflection. It is true that China has developed its space capabilities by 'borrowing' generic designs from others (predominantly through the proliferation chain emanating from Russia) but it has also engaged in a number of successful cooperative programmes with countries such as Canada; Russia and Brazil[94]. The indigenous technological development has built on these foundations to the extent that China is now able to offer a keen commercial launch alternative to the traditional cartel of US, European and Russian launch providers. China has sold satellites to nations such as Nigeria and although the US engagement with China on space has been limited in the extreme, China has advanced technologically and has formed a number of significant strategic space partnerships[95].

The US ban on exporting any space-related technology to China since 1999 has been matched by a refusal to have any meaningful dialogue whether through international forum or bilaterally. This isolation of China's space programme has fostered the belief in China that the US seeks to arrest its progress in space in order to thwart the Chinese ability to revolutionize its

[94] The China-Brazil Earth Resource Satellite has been touted as the largest space venture by two developing countries and possibly indicative of China posturing toward 'leading' other developing countries into space.
[95] Joan Johnson-Freese, *Strategic Communication with China: What Message about Space?,* China Security, (Issue Number 2, 2006), p44.

warfighting technologies and win on the high-tech battlefield of the future[96]. A 'dialogue of the deaf' has resulted in both sides talking past each other. In the absence of any meaningful dialogue, the US continues to try and extract information about the co-mingled Chinese civil and military space programmes from under the shroud of opacity that typifies the Chinese cultural anathema to transparency. Correspondingly, the Chinese remain reluctant to trust a schizophrenic US that proclaims loud denial of any plans to deploy space weapons whilst publishing concepts and doctrine to the contrary[97] and refusing to enter into any formal agreement banning weapons in space. The US position is further undermined through the continued commitment to its Ballistic Missile Defence (BMD) capability. The capability inherent in the exo-atmospheric interception of a ballistic missile is the same as that of a direct ascent anti-satellite weapon and continues to thwart US protestations about not wanting to weaponize space.

The challenge facing the US from the rising Chinese space capability is not so much the rising space capability itself but avoiding the potential for the intentions of each side to be misinterpreted in a pernicious security dilemma which would become the source of increased tensions between a nervous hegemon wary of challengers to its critically important space asymmetry, and the ambitions of a rising great power suspicious of the intentions of foreign states. Support for this hypothesis can be found in the cultural foundation of

[96] Bruce Blair and Chen Yali, *The Space Security Dilemma,* China Security (Issue Number 2, 2006), p4.
[97] In 2003, the US released its *Transformational Flight Plan* which included plans for orbiting weapons that would send giant metal rods crashing to Earth. These rods were officially called Hypervelocity Rod Bundles but were more colloquially and colourfully referred to as 'Rods from God'.

Chinese strategic thinking. In China, the Great Wall is not merely a symbol of the many glorious accomplishments of China's ancient civilization; it also epitomizes, for many scholars, the Chinese Confucian preference for conflict aversion and defensive-mindedness. This cultural defensiveness is matched by a realpolitik outlook which favours military solutions and is offence-orientated. This combination has been labelled the "Chinese Cult of Defence"[98] and has some particularly alarming connotations for signalling in the potential space security dilemma. One prominent Chinese military scholar claims that virtually all of the wars that China has fought in more than four thousand years of dynasties have been civil wars or wars to unify the country, and that all eight "military actions" since 1949 have been waged in "self-defense"[99]. This peculiarly active form of self-defence is illustrated in the rationale used for the attack on Vietnam in 1979 which was labelled by Beijing as a "self-defensive counterattack". A similar logic of calibrated force in self-defence was applied to China's intervention in Korea in October 1950, to the various clashes in the Taiwan Strait, to its brief but bloody border war with India in 1962 and with the Soviet Union in 1969 – all of which were labelled "self-defence counterattacks"[100].

Such aggressive interpretations of a defensive posture are not without precedent. The line between legitimate and illegitimate first strikes is not going to be drawn at the point of imminent attack but at a point of sufficient threat. This vague interpretation of pre-emption should have three

[98] Andrew Scobell, *China's Use of Military Force: Beyond the Great Wall and the Long March,* (Cambridge University Press, 2003), pp4-26.
[99] Ibid, p31.
[100] Ibid, p32.

rudimentary underpinnings to fall within the Just War tradition. First, there should be a manifest intent to injure, second there should be a degree of active preparation that makes that intent a positive danger and, finally, a situation should exist where waiting, or doing anything other than fighting, would greatly magnify the risk[101]. The Israeli Six Day War is cited as an example of a Just pre-emptive strike; whether the Chinese strikes in Vietnam and Korea would be regarded as Just is open to question. What the Chinese interpretation does illustrate is a very expansive interpretation of 'defence' that would justify the initiation of an early and decisive first strike if it believed its security was threatened. When such an active construal of 'defence' is coupled with a heightened sense of threat that China's political and military leaders are prone to, the challenge from China's growing space capability takes on a very different hue[102]. Couple this with the US propensity for preemptive attacks in their strategy of primacy and the potential for misunderstanding and subsequent action is clear. China's strategic behaviour is influenced not just by the realpolitik strand but also a Confucian one. The combined effect has been dubbed the 'Chinese cult of defense' in which realist behaviour dominates but is justified as defensive on the basis of a pacifist self-perception[103]. With this background, the recent Chinese anti-satellite test and the potential for China to use that capability as a first strike option to deny the US the asymmetric advantage they enjoy in space, makes US nervousness understandable. Consequently, the security challenge the US faces from a rapidly advancing Chinese space and missile capability is not

[101] Michael Walzer, *Just and Unjust Wars: A Moral Argument with Historical Illustrations,* (Basic Books, Fourth Edition, 2006), p81.
[102] David Shambaugh, *China's Military Views the World: Ambivalent Security,* International Security (Winter 1999/2000), pp52-79.
[103] Andrew Scobell, *China's use of Military Force,* p38.

only manifest in the technological competence and hardware that China is fast developing but also in managing the perception and potential misperception of US intentions in space.

The Chinese cultural propensity for using calibrated force and its tendency to perceive threats is not helped by US hyperbole and hypocrisy. That the Chinese flew sensitive military equipment on the Shenzhou V manned space mission is entirely probable, however for the US to go one step further and extrapolate that "future Chinese manned space stations planned for the next decade could perform defensive and offensive military-space missions"[104] appears to be no more than pious indignation. This is particularly so when viewed against the generally accepted knowledge that the US Space Shuttle cargo bay dimensions were dictated by the Pentagon to ensure intelligence payloads could be carried. Such US hyperbole can appear to be disingenuous from a Chinese perspective.

While the US may see itself as Han Solo or Obi-Wan Kenobi, much of the rest of the world, including China, hears the voice of Darth Vader when the US speaks of its plans in space[105]. If 'star wars' are to be avoided, clearer signalling of the intentions of both sides is necessary. That can only be achieved by increased openness and dialogue.

---

[104] Richard D. Fisher, *Statement before the House Armed Services Committee,* (27 July 2005), cited in Joan Johnson-Freese, *Strategic Communication with China,* China Security (2006), p50.

[105] Joan Johnson-Freese, *Heavenly Ambitions: Will America Dominate Space?,* (Columbia University Press, 2006), cited in Joan Johnson-Freese, *Strategic Communication with China: What Message about Space?,* China Security (Issue Number 2, 2006), p53.

Commercial and Economic Challenges

The US ITAR regulations were designed to halt the transfer of militarily relevant technology to other nations through the restriction of technological exports. The ITAR regulations have become entrenched, complex and bureaucratic and are having a particularly harsh impact on the competitiveness of the US space industry by restricting US markets and allowing competitors room to flourish. For example, the UK space industry has found that the many export restrictions applied to relatively benign US technology, such as the honeycombed aluminium used to build satellites, are so difficult and time-consuming to overcome that US sourced material is rarely even considered[106]. Indeed, the ITAR restrictions have become so constraining that the UK space industry, along with other nations, has turned wherever possible to non-ITAR restricted markets to source components and associated technology and expertise. Some in the European space industry have even taken to advertising 'ITAR-free' satellites. Alcatel is reported to have won a recent contract to supply the Chinasat 9 direct broadcast television satellite on the basis of being able to offer an "ITAR free" solution[107]. This strategy of sourcing components and technology that are not bound by the stultifying ITAR bureaucracy was originally more costly in terms of the time taken to source the components and their availability. Over time, the demand for non-ITAR components has generated a flourishing space industrial base outside the US which has developed to the point that it is now

[106] Dr Stuart Eves, Military Director of Surrey Satellite Technology Limited, in discussion with the author, 4 April 2007.
[107] Peter B. de Selding, *US Export Restrictions Help Alcatel Win Chinasat9,* Space News, 21 June 2004, http://www.space.com/spacenews/archive04/alcatelarch_062104.html

able to compete directly with the US giants in the space industry. The new markets are most evident in Europe where, alongside the traditional space industry, a growing number of small niche companies have blossomed.

The UK, which is by no means a large player in space, has an industry with a turnover of £5.2 billion, contributing around £2.4 billion to UK GDP in 2004/05 and employing 17,560 people, predominantly graduates[108]. This growing UK space industry is developing a business model which is increasingly turning to Commercial-off-the-Shelf (COTS) components rather than the space qualified components traditionally used in the US. The rationale being that the quality required to meet the reliability demanded of COTS products today, with production runs of millions of units, is proving to be more dependable than the so-called high-reliability components which are produced in small numbers to bespoke specifications. The combined effect of an ITAR restricted US export market and the growth in mobile technology that has direct applications in space for the growing non-US space industry, is escalating commercial and economic competition to challenge the US leadership[109]. Freed from the suffocating competition of the large US companies, an alternative space industry is fast emerging. Whilst the ITAR restrictions have undoubtedly limited the transfer of US technology, the availability of affordable, high capacity and reliable COTS technology, married to innovative satellite construction processes using common platforms, is a

[108] John Davey, BNSC Head of Technology lecture on 27 April 2007, at the Air Warfare Centre Military Applications of Space Course.
[109] Mobile phones, cameras and laptop computers all provide small, light and reliable mobile technology that can be used in satellites. All of this technology is available at a fraction of the mass and volume of traditional space-qualified components and has a reliability that could only have been dreamed of ten years ago.

business model that is being repeated globally with countries such as India, Brazil and China who are all marching ahead with space-related technologies developed by indigenous companies.

The US has been aware of the alternative model adopted by many of the European space companies but has so far not been sufficiently nimble to follow, nor has it had any incentive to do so. The US space industry is dominated by very large corporations with long-established processes and cultures that would be difficult to change to the more flexible and innovative model that is emerging in Europe. Such a change would also reduce their ability to compete for and launch the large, very lucrative, complicated and very capable satellites used by the US government. The impact of the growing, non-ITAR restricted competition described is not solely concentrated on manufacturing. The service sector and, in particular, the US technical expertise and the intangible competences gained through years of experience in the space industry are not immune to the tangling ITAR restrictions. The Intelsat use of Chinese launch vehicles provides a very good case which illustrates the reach of ITAR restrictions.

On 15 February 1996 a Long March 3B rocket carrying the US-built Intelsat 708 crashed shortly after blasting off from the Xichang launch centre in China. It was the third such launch failure in a little over three years; each of the failed launches carried a US-built satellite payload. Such launch failures are still not uncommon in isolation but three from the same Long March series of rockets drew the attention of the international space launch

insurance industry. Following an initial investigation by the Chinese state-controlled launch provider, The China Great Wall Industry Corporation, representatives of the space insurance industry insisted on an independent review. The subsequent investigation of the launch failures was conducted by an Independent Review Committee comprising Western aerospace engineers from the manufacturer of the satellite, Loral, and other specialists drawn from companies including Hughes Space and Communications, Daimler-Benz Aerospace and some retired experts from Intelsat, British Aerospace and General Dynamics[110]. The Independent Review Committee report agreed with the initial Chinese investigation but also identified a further two possible causes of the failure and recommended tests be conducted to prove or disprove each scenario. Following these tests, the Chinese authorities were able to confirm that the cause of the failures was indeed one of the additional scenarios proposed by the Independent Review Committee. This example of multinational space cooperation, involving the nascent Chinese commercial space launch industry and the established Western industry, would help move forward the reliability of the Chinese space launch capability to the benefit of all concerned.

The advent of a reliable Chinese space launch capability increases the international launch capacity and reduces the cost of launch to the space industry[111]. This benefit was as a direct consequence of the diagnosis of the

[110] The United States House of Representatives Select Committee on US National Security and Military/Commercial Concerns with the People's Republic of China 1999 – The Cox Report, Chapter 6. p97.
[111] This is particularly valuable for the US after the loss of the Challenger and Columbia Space Shuttles. The subsequent halting of the programme and consequent reduction in launch capacity significantly reduced the US heavy lift capacity.

Independent Review Committee into the Long March rocket failures. The increased reliability also had the effect of reducing insurance premiums on Chinese commercial launches. The cooperation evident in the US led multi-national International Review Committee was a model cooperation that should have been applauded. The cooperation also reflected the sentiments of the Clinton Administration's US Space Policy which was being drafted as the Committee sat and contained an aim to pursue "greater levels of partnership and cooperation in national and international space activities"[112].

It seemed everyone had benefited. However, a chance reading of the launch failure investigation in *Space News* by a Defense Technology Security Administration (DTSA) official, Robert Kovac, triggered a major inquiry which led to the threat of criminal prosecution for Loral and a House of Representatives Select Committee inquiry (the Cox report) into the whole affair. At the heart of the issue was the fact that the Independent Review Committee had exposed the state owned Chinese space industry to Western diagnostic processes which could lead to improvements in reliability for all Chinese missile and rocket programmes – including the military variants of the Long March rocket. The impact claimed by the DTSA was disputed by the CIA in the Cox Report. The CIA reported to the State Department that "the Independent Review Committee report did not disclose any significant missile-related technology or know-how to the PRC's ballistic missile program."[113] Much of the information related in the report was claimed to be in the public

[112] PDD/NSC-49 (PDD/NSTC-8). *National Space Policy,* NASA Historical Reference Collection, File: 18242 *Clinton Space 1996,* 19 September 1996, p1.
[113] The United States House of Representatives Select Committee on US National Security and Military/Commercial Concerns with the People's Republic of China 1999 – The Cox Report, Chapter 6, p.159.

domain but even this was not sufficient to excuse the transgression. As an example, the Cox Report related, passing a foreign national an article from the Encyclopaedia Britannica would not require an export licence. If the article was passed by an engineer in the context of specific technical discussions, a defence service would have been provided and an export licence required[114]. The Loral case raised a number of sensitive issues for the US, has been the subject of lengthy and detailed investigations and has served to deter US companies from dealing with any foreign space organization out of fear of subsequent prosecution.

It is clear that the information contained in the International Review Committee Report and the exchanges made during meetings could aid the Chinese development of the ICBM missile, relatives of the Long March commercial launch rocket[115]. The findings of the Cox Report also illustrated that the dual use of technology is becoming widespread and increasingly difficult to differentiate. Combined with the restrictions on the use of information in the public domain described, it is not surprising that many US companies are now highly reticent to release any information relating to space capabilities at all without first going through the very slow, cumbersome and bureaucratic release procedures. This has had a number of effects. Many US companies are finding it increasingly difficult to find non-US partners to collaborate with or are not seeking any collaboration at all to avoid tying up a project in ITAR bureaucracy. US companies are also reticent to seek

[114] Ibid, p164.
[115] The improvements resulting from the report related to the inertial measurement unit of the rocket. For a ballistic missile with a target range of 5,500 miles, an error of one foot per second in the velocity at the last-stage burnout (23,000 feet per second) would lead to an error in target impact of about one mile.

overseas contracts for fear of not being able to meet their contractual deadlines because of the quagmire of ITAR regulation they would have to wade through. Loral Space and Communications have been trying for six years to receive US government approval to deliver the Chinasat 8 satellite without success – the satellite remains in storage at Loral's Palo Alto plant[116]. Furthermore, it has become increasingly difficult to acquire indemnity on the international insurance market for ITAR-related launches. Denied information on the technology used in the construction of the satellite, insurers have become reticent, without full disclosure, to insure US ITAR-related launches or have significantly increased their premiums – further reducing the competitiveness of the US space industry. One final, unintended consequence of the stringent US export restrictions and the consequent contraction of the US space industry is that the number of engineers and scientists working on space related projects is also declining. This factor may take some time to correct.

Despite these difficulties, US companies such as Northrop Grumman and Boeing, still have large Government space programmes to fall back on. But with a US economy entering difficult times, this comfortable cushion may not last much longer as the patience of government is being tested by over-budget, delayed programmes such as the Space Based Infra Red (SBIRS) programme which has taken a decade to develop and has tripled in cost from its early estimates to $11 billion[117]. This has led to increased scrutiny of the US space industry and the way in which contracts are let. The US

[116] Peter B. de Selding, *US Export Restrictions Help Alcatel Win Chinasat 9,* Space News (21 June 2004).
[117] Amy Butler, *Turning Heads*, Aviation Week & Space Technology, (16 April, 2007), p36.

Government is becoming agitated by such profligacy. Given the freedom to develop without the smothering competition of the large US firms, who have been tied down, Gulliver style, by a myriad of ITAR limitations, the competition for affordable, responsive and innovative space technology from the non-US industry is growing rapidly. Companies such as Surrey Satellite Technology Limited (SSTL) in the UK – recognised as world leaders in small satellite technology – offer affordable access to technologically proven, innovative space capability. The US market has been starved of Schumpetarian style competition by the arcane ITAR restrictions and as a result, the US space industry has merged into a few giant leviathans that are unable to match the agility and creativity of the emerging global space market. The US still retains technological leadership in the very specialized US government market for high resolution earth observation satellites and other technically demanding intelligence related applications. It is beginning to lose market share of the less technologically demanding but more affordable space capability offered by many non-US companies and the capability offered by some small satellites is also beginning to encroach on the traditional US military and intelligence capabilities.

If it was the aim of the ITAR regime to ensure the US retained a technological lead by restricting the proliferation of their technology it is succeeding, to a degree. But, in attempting to corral its technology, it has spurred the non-US space industry to evolve an alternative model which is proving increasingly relevant to space capability and is providing affordable access to space for more states and non-state actors. The US technology is

largely isolated and is limited by an ITAR anchor which prevents free access to global space markets. The ITAR regime has been referred to by a senior US space official as a "child eater" and the many attempts at change have failed due to vested interests in the US Senate[118]. Overcoming the strangling effects of ITAR is a major challenge for the US space industry. The Centre for Nonproliferation Studies and the Space Policy Institute of George Washington University declared at the end of an international seminar on *Space Conflict or Space Cooperation* that "most participants cited current US export control restrictions as a major impediment and urged reform of the ITAR regulations"[119].

The US could take a lesson from Isaac Asimov's *Foundation* trilogy, in which he implied that the best way to secure the dominance of the Foundation's technology was not to guard it but to make it widely available, creating a dependency that can be controlled rather than stimulating a competing capability. In discussions between the Europe based Symphonie communications satellite consortium and Washington in 1963 to provide a launcher for the new satellite, the US limitations were so constraining[120] that it convinced Europe of the need to develop its own launch capability which would eventually compete directly with the US launches[121]. The ITAR regulations and the US nervousness about technology transfer in general

[118] Senior Pentagon official in discussion with the author, summer 2007.
[119] James Clay Moltz, *Space Conflict or Space Cooperation?* 26 January 2006, http://www.cns.miis.edu/pubs/week/060126.htm
[120] Concerned that Symphonie and other European satellite communication endeavours might jeopardize their control over Intelsat, the US placed stringent conditions on the launch, insisting that any satcom be project remain experimental and be limited to Europe.
[121] Michael A. Taverna and Frank Morring Jr, *Space Odyssey,* Aviation Week & Space Technology, (19 March, 2007), p88.

seem to be creating the antithesis of their intention. Freed from the dominating market presence of the US space industry giants, innovative and affordable space technology has proliferated around the world providing access to space capability to many of the nations the US was seeking to disadvantage.

The Space Governance Challenge

The single most influential space treaty, the 1967 UN Outer Space Treaty, has survived the test of time. Whilst such precedent is encouraging, the hope that the Outer Space Treaty and its subordinate treaties may continue to be adhered to is not a basis upon which to base national security. China and Russia have repeatedly proposed a further treaty at the UN Conference on Disarmament, the perennial PAROS. The US has consistently argued that such additional legislation is not necessary, that the 1967 UN Space Treaty is sufficient and has stood the test of time, and that the US preference is to deal on a bilateral or multilateral basis with other space-faring nations[122]. This policy was made clear in October 2005 when, after many years of abstention, for the first time the US cast the only 'no' vote (160 countries voted 'yes' and Israel abstained) on the annual vote on the need for a PAROS Treaty. The position was further entrenched in the 2006 National Space Policy which stated that

[122] Major General James Armor, *Director, National Security Space Organisation,* in discussion with the author, 12 June 2007.

> The United States will oppose the development of new legal regimes or other restrictions that seek to prohibit or limit US access to or use of space[123].

This was a discernable shift from the previous National Space Policy of the Clinton Administration in 1996 which stated that

> The United States will consider and, as appropriate, formulate policy positions on arms control and related measures governing activities in space, and will conclude agreements on such measures only if they are equitable, effectively verifiable, and enhance the security of the United States and our allies[124].

The shift away from the liberal institutionalism of relying on the UN and legal means of managing space to a more realist perspective and the reliance of power and alliances to secure US leadership is much more resonant with the more recent neo-conservative US posture than the traditional US liberalism in space espoused by the likes of Eisenhower. The current more realist posture of primacy will also leave the US open to accusations of securing space as the 51st state of the United States rather than the final frontier of exploration[125]. Managing space and the legal frameworks that govern its use as more and more nations join the space club will continue to be another challenge that the US must face.

Environmental Challenges

In 2000 Surrey Satellite Technology Limited (SSTL) launched a 1Kg nano-satellite called the Surrey Nanosatellite Applications Platform 1 (SNAP-1) as a

[123] US National Space Policy, 31 August 2006, http://www.au.af.mil/au/awc/awcgate/whitehouse/ostp_space_policy06.pdf
[124] Office of the Press Secretary. PDD/NSC-49 (PDD/NSTC-8). *National Space Policy,* NASA Historical Reference Collection, (File: 18242 "Clinton Space 1996"), 19 September 1996, p13.
[125] Bronwen Maddox, *America Wants it all – Life, The Universe and Everything,* The Times, 19 October 2006.

piggy-back payload on a Russian Cosmos launch. With a micro propulsion system, three-axis attitude determination and control, GPS orbit determination and on-board computing and communications, SNAP-1 was able, moments after separation from the rocket, to take an image of the classified Russian satellite that it accompanied into space and transmit the image back to Earth. The impact of SNAP-1 created considerable consternation in Russia, prompting a number of alarmist protestations. SNAP-1 was launched to demonstrate the technology for remote sensing and formation flying missions as part of a broader concept comprising a swarm of satellites. The basketball-sized SNAP-1 then went on to attempt a rendezvous with a Chinese satellite. Over a number of days, SNAP-1 manoeuvred in orbit, using its innovative propulsion system[126], to position itself within close enough proximity of the Chinese satellite to demonstrate how a small, difficult to observe, low cost micro-satellite could conduct an in-orbit rendezvous. The COTS technology used, married with innovative propulsion solutions and rapid construction processes demonstrated the accessibility and affordability of space technology and the potential utility of such small satellites. Such technology is available today to any Customer with something in the region of £1M to spend and whilst its employment can be entirely peaceful – such as in-orbit inspection of satellites – similar micro satellites could also be employed in more covert, offensive roles. Fears of micro-satellites such as SNAP-1 being exploited as an anti-satellite weapon to destroy or disable much larger, expensive and difficult to replace satellites in orbit has generated considerable

[126] Regulations demand that pressure vessels for fuels, regardless of their size, have to undergo an expensive and time-consuming testing programme to gain certification before launch. The fuel pipes which take the fuel from the vessel to the propulsion unit do not have to undergo such certification. Consequently, SNAP-1 used a short piece of coiled fuel pipe to hold the small amount of fuel it needed to manoeuvre and overcame the need for certification.

nervousness, particularly in the US. The need for a SSA capability of sufficient fidelity to identify objects in orbit that could pose a threat has become the key foundation of US developments and future plans in space[127].

The impact of SNAP-1 was also to accelerate research into the use of small satellites as 'Angels' to protect, service and possibly repair satellites in orbit. The same concept could also be used to create 'Demons', able to covertly approach the satellite of an adversary and disrupt their operation or even destroy them. Such scenarios seem far-fetched but as SNAP-1 demonstrated; they are very much of the here and now. Such capabilities are of increasing interest to many nations and represent a growing potential threat to the major space powers that have some very valuable, critically important earth observation and monitoring satellites in vulnerable low earth orbits. Any satellite that can manoeuvre has the potential to be used as a weapon, if that satellite is sufficiently small it becomes difficult to detect and the potential to deny, disrupt or destroy a satellite in orbit with little or no risk of attribution should be a cause for concern to all space-faring nations. For the US, it represents the clearest possible threat to the asymmetric advantage it enjoys in space. This potential environmental threat to US space dominance reinforces the US National Security Space Office Director's goal of developing a SSA, of sufficient fidelity, to be able to detect and track such objects and negate the ability of a potential adversary to use micro-satellites for hostile purposes, without significantly greater risk of attribution and consequent retaliation.

[127] Major General James Armor, *Director, National Security Space Organisation,* in discussion with the author, 12 June 2007.

It is reported that an 'architectural concept' for fielding passive electro-optic sensors on all spacecraft is being considered by the US in an effort to add to an awareness of objects in space to detect the approach of another satellite, assess any damage and determine the cause of the damage and whether it was accidentally inflicted from micro-debris or from more sinister causes such as laser or a high-powered microwave weapon[128]. A kinetic response in space to any attack on a US satellite is highly unlikely because of the collateral threat posed by the additional debris generated in the attack. The recent Chinese ASAT test is reputed to have generated over 35,000 pieces of orbital debris, much of which will take several decades to descend far enough to be burned up as they enter the Earth's atmosphere[129]. This recent example illustrates the potential danger to the constellations of US national assets and those of allies and of the commercial satellites on which the US and others rely.

The environmental challenge posed by the increasing volume of debris in the militarily critical low earth orbits, the proliferation of space-faring nations and sub-state actors is of concern. Add to this the demonstration of China's anti-satellite capability coupled with the potential for manoeuvring small satellites exhibited by SNAP-1 and the US nervousness about protecting its dominant space capability is understandable. With rising great space powers such as China directly challenging US leadership, the self-imposed

[128] Amy Butler, *Milspace: Space Control Sees Small Piece of the Air Force's White Budget,* Aviation Week & Space Technology, (12 February, 2007), p27.
[129] Dr James Clay Moltz, *Charting a Course for Improved US Space Security,* submission to the Subcommittee on National Security and Foreign Affairs, US House of Representatives, 23 May 2007, p2.

constriction of the US commercial capability, the rising demand for more formal treaties to govern activity in space and the physical threat from debris and a proliferation of space-farers, the US should be concerned that its lead is being challenged on many fronts. The US only perceives those challenges, such as the one from China, where there is relevant experience to draw upon such as the challenges America faced during the Cold War. The commercial challenges are recognised by many in the space community but the US is unable to overcome some entrenched views in Congress. The legal challenges reflect a growing sense that greater governance is required to manage the proliferation of space-faring actors. Finally the environment is the most direct and most immediate challenge but one the US, outside the space-community, seem oblivious to. Each challenge is significant but in sum produce a broad front that the US is blind to, does not have the resources to deal with, or is incoherent in its strategy. In short, to successfully tackle all these challenges, they must be treated holistically.

CONCLUSION

The earth orbiting satellite has become the first tool of the human race that is not limited by the fuel it can carry, the boundaries of other nations, or by the earth's atmosphere or its oceans. The fact that it can work for any nation over which it passes is a symbol of a great society of the world, and, perhaps more than any tool before, a portent of a more universal society.

James Webb[130]

The US has risen to its dominant position as the space hegemon with few challenges. Those challenges it has faced it has overcome with a degree of panache and has certainly proved to be a 'beacon' for the world to follow. That the US was able to rise to these challenges is testament to the character and resilience of the American nation. De Tocqueville captured some of these strengths in his commentary, recognising the resolve and capability of Americans to drive ahead when goals could clearly be seen and not doubting their ability to meet an external threat[131]. But just as De Tocqueville could not assay what would happen when no crisis existed and the issues were complex and removed from their day-to-day needs of the American people, so the challenges the US face in space today are evident but not focused sharply enough to be seen as a crisis. They also fall into the shadow of the glaring challenges faced by Islamic terrorism and the insurgency in Iraq and Afghanistan. That said, if the challenges faced in space are not tackled, the US could find itself undermined militarily, technologically and economically.

[130] James Webb, *Letter to the President,* (30 November 1964), HST Library, Webb Papers, Box 36.
[131] Alexis de Tocqueville, *Democracy in America,* (Oxford University Press, 1947), pp116-139, cited in James E. Webb, *Space Age Management: The Large Scale Approach,* (McGraw-Hill Book Company, 1969), p19.

To the outside world the apparent rhythm of the early Space Race was set by the Soviets. They gained prestige in the eyes of the world with the first satellite to orbit the Earth and reinforced this prestige by putting the first man in space. These headline grabbing achievements also provided credibility to the missile capability claims made by Khrushchev. The missile bluff was subsequently revealed as a key tenet of the Soviet policy of brinkmanship which was described in the secret 'meniscus' speech of 8 January 1962 to hide the fact that the Soviet Union was by far the weaker superpower[132]. The bluff was threatened by US spy planes and in particular by the potential ability of satellites to see deep inside the Soviet Union. This potential surveillance of the heart of Soviet territory resulted in the hard line in the UN regarding satellite overflight but also fuelled the necessity for the US to 'catch up' and eventually overtake the Soviet perceived lead in space. Ultimately, the policy Khrushchev adopted enabled the Soviets to survive the early days of the Cold War but because of its costs and provocative spur to the US, it was to sow the seeds of their eventual downfall. The US was duped into a race in which many commentators believe they were already comfortably in the lead. The US unequivocally captured the lead with their victory in the Space Race and they have successfully retained that lead – materially, perceptually and ideologically. Now firmly established at the front of the pack, the prospect of the pack gathering and beginning to chase down the American space leviathan is becoming a prospect that seems increasingly close. The US confidence in their space leadership is well-founded but perhaps the lead they have is not as strong as they believe.

[132] Aleksander Fursenko and Timoth Naftali, *Khrushchev's Cold War,* (W. W. Norton & Company, New York, 2006), p5.

There are some enlightened and very knowledgeable US space experts who are becoming increasingly concerned about the US reliance on space for critical parts of the national security and economic infrastructure. The most recently issued National Space Policy documents have recognized the critical importance space plays in national security. In 1989 the policy claimed that "United States pre-eminence in the key areas of space activity is critical to achieving our national security, scientific, technical, economic, and foreign policy goals"[133] and in 1996 that "space is central for preserving peace and protecting US national security"[134]. Most recently, in 2006, the Policy stated that "to enhance national security, the United States must have robust, effective and efficient space capabilities."[135] But each administration has stopped short of delivering the budget required to meet the challenges faced. When the US Director of the National Security Space Office was asked whether, under these circumstances, the US would retain its leadership in space; he paused and answered "no". Asked who he thought may replace America as the leader in space, he replied without hesitation: "China"[136].

A remarkably candid statement by such a knowledgeable and well respected Pentagon authority was surprising but it also reflected a degree of pragmatism and perhaps a shift in the perception of space and its association

[133] George H. W, Bush, NSPD-30 (NSPD-1), *National Space Policy,* NASA Historical Reference Collection (File: 012605), 2 November 1989, p1.
[134] Office of the Press Secretary. PDD/NSC-49 (PDD/NSTC-8), *National Space Policy,* 19 September 1996, p1.
[135]George W. Bush, *National Space Policy,* 31 August 2006, p1. http://www.ostp.gov/html/US%20National%20Space%20Policy.pdf
[136] Major General James Armor, *Director, National Security Space Organisation,* in discussion with the author, 12 June 2007.

with technological pre-eminence. The 'global war on terror' is consuming huge portions of the US budget and many areas, space included, are suffering as a consequence. This represents the pragmatic reason why space is not receiving the funds necessary to meet the policy objectives desired and the rising challenge posed by states such as China. It also reflects the priority space has in terms of what is critical to the nation at the moment. Just as winning the Space Race was seen in the wider context of its impact on the Cold War, so overcoming the challenge thrown down by international terrorism is rightly seen as the critical threat to the authority and security of America today. Whilst the view expressed is pragmatic, it fails to recognise that the loss of the space capability that the US heavily depends on in the fight against terrorism could lead to a critical undermining of the US asymmetric technological advantage that enables it to prosecute the fight so effectively. Consequently, it would be short-sighted to ignore the challenges faced in space and the threats posed. Space continues to be vital to enabling much of the technology used to fight terrorism and it also continues to fire the imagination of millions of people[137]. Whilst the engineering has become less breathtaking[138], the idea of space and the sense of wonder and drive to explore it remain as exciting today as they were half a century ago. However, in terms of technological advances that an ambitious nation would want to be pre-eminent in, it is perhaps the fields of nanotechnology and genetics that will carry the scientific prestige that demands technological leadership. This

[137] The space tourism industry is burgeoning and Virgin Galactic is at the forefront, offering a trip into space to experience true weightlessness, a view of the earth from above the atmosphere and returning to Earth in time for cocktails, all for around £100,000 per person. There is no shortage of customers.

[138] The ability to view 'on the spot' reports on CNN via satellite link from the other side of the world when we watch the news barely registers as a technological feat.

opinion was reflected in a recent Economist leader article which identified biological breakthroughs in RNA as being as important as any previous scientific breakthroughs in physics[139]. They will certainly play an important part in how the world develops but whether they will carry the kudos of space leadership is not clear. Furthermore, even though Pentagon insiders may be questioning the national commitment to space, the reality of space as a future military domain is not in question.

In the most recent US Quadrennial Defense Review, the vision for space was to:

> Continue to enjoy an advantage in space capabilities across all mission areas. This advantage will be maintained by staying at least one technology generation ahead of any foreign or commercial space power[140].

It is clear from this that the US desire to stay in the lead in space but it is equally clear that they are facing challenges on a number of fronts both domestically and internationally that make sustaining the lead they have increasingly difficult. There is growing evidence to suggest that the US lead is being eroded by rising space-faring nations such as China, by emerging alternative commercial space markets and by the demand to govern the exploitation of the space environment. In parallel, there seems to be little evidence to suggest that the US have acknowledged the holistic nature of the many challenges they face.

---

[139] The Economist, *Biology's Big Bang,* (Vol. 383, No. 8533, 16-22 June 2007), p13.
[140] US Department of Defense, *Quadrennial Defense Review Report,* (6 February, 2006), p.55.

Whilst many believed that the Soviets had created a missile gap in the original space race, they did not actually lead in any meaningful category of missile technology. The view constructed by the man in the street, fed by a misinformed media, was the all important perception and one that the US had to fight hard and commit billions of dollars to overcome with the Apollo moon launches. Today, the US is perceived to have the clear lead in space technology and in many areas they do. This lead is fast being eroded by the more agile and innovative space industry growing outside the US and the more committed Chinese space programme. If they are not careful today, the constructed perception bubble that keeps the US comfortably assuming dominance in space may burst and they will find themselves faced with a decision over whether being first in space really does mean what it used to do for national prestige.

The first Space Race was entered into against an identified adversary who had succeeded in capturing the imagination of the world with the launch of *Sputnik I*, giving credibility to their ambitious technological claims which directly challenged US security. The need for a US response was clear and that response was captured by President Kennedy in his special message to the Congress on urgent national needs on 25 May 1961. The goal of sending a man to the moon and safely returning him to earth was embraced by Washington and the whole of America and was used as a rallying cry to demonstrate American virility and technical superiority over the Soviet challenger. It was translated into action by decision-makers shaped by common experiences in WWII. By contrast, the challenges to US dominance

in space today are more diffuse. America demonstrably already has the lead in space, leaving little need to respond; and the cohort of decision-makers in Washington and the American public at large lack a universal rallying call to harness a concerted response to the vague and complex challenges faced.

There is little evidence to suggest that the few voices reporting US space vulnerability are being dismissed in a coherent US policy to surrender space leadership and the dominance that secures, more it is blindness to the extent and potential impact of the challenges faced. It is possible to draw a parallel from historical context. Geographically protected by two great oceans and with benign neighbours, the US rightly believed itself to be secure, perhaps even invulnerable from attack and maintained a relatively small military and avoided complex, entangling alliances. Up until 1941 this propitious position blinkered the US to many of the implications of international anarchy and the associated security dilemma. The long-held leadership in space today represents almost four decades of dominance and has generated a similar sense of security and invulnerability that may require a discontinuous event such as the sinking of the passenger ship Lusitannia by a German U-Boat which provided the catalyst for the US to eventually enter the First World War in 1917[141]. An attack on an American satellite that was attributable to a sovereign state or identifiable non-state actor or, more likely, the attempted disruption or denial of the freedom to operate a satellite may be the trigger needed for full recognition of the significance of a successful challenge to the US leadership and dominance enjoyed in space.

[141] The British liner Lusitania was sunk in 1915 by a German U-Boat, killing 128 Americans. This proved to be the catalyst for America to abandon its tenuous position of neutrality and enter the war on the side of the allies.

The space sector of military, security and economic activity is an area with high technological and financial risks and requires strategic investment decisions. The US has traditionally been bold and confident, taking on the technological risks and making the necessary investments. Its confidence is beginning to ebb as it sees threats and tries to protect its riches of knowledge and experience of space harvested over the last 50 years. It is now risk averse and is avoiding the strategic investment necessary to secure its role as the world leader in space and in the technology used to achieve it. That the Space Race is over and the Space Age is temporarily ignored seems disappointingly apparent. That it will be revived in the future seems inevitable – the desire for challenge and exploration and the need to satisfy our seemingly insatiable appetite requires vast new resources. The future of humanity is in the stars and the benign leadership of *Pax Americana* offers the brightest option for successfully meeting this future. Embracing cooperation, opening up its technology and markets to free competition to promote the spread of liberal democratic exploration of the final frontier is a tantalising prospect.

The US sense of itself in terms of exceptionalism and as a 'beacon' for the world to follow has served it well. The unchallenged dominance has seen the US spread its influence militarily, politically, economically and culturally. This influence has been no less dominant in space. Unchallenged since the Cold War and able to influence the terms of development of other space-faring actors, the US has sat comfortably in control in space. That dominance

is now reaching the point at which it is beyond the resources or influence of the US to dominate as it has previously done. More assertive but with less influence, the US dominance in space is being challenged on a number of fronts. None of the challenges comprise particularly pernicious threats but they all have the potential to be misinterpreted as being more malevolent. The peaceful use of space was the goal of Eisenhower and has been the avowed aim of all space-faring nations. To ensure that this happens, dialogue with China should be undertaken to avoid misunderstanding, the ITAR straightjacket should be loosened, free-ranging discussions on governance and management of space debris should be complete the agenda that the US should engage in to sustain its leadership but not dominance of space.

BIBLIOGRAPHY

Primary Sources

Interviews

4 April 2007, Military Director of Surrey Satellite Technology Limited.

18 April 2007: Director of Air Staff, Strategy Space.

27 April 2007, British National Space Council, Head of Technology.

12 June 2007, Director, US National Security Space Organisation.

Documents

Communication from the Commission to the Council and the European Parliament (COM(2007) 212), *European Space Policy,* Brussels, 26 April 2007.

Cox Report, The United States House of Representatives Select Committee on US National Security and Military/Commercial Concerns with the People's Republic of China 1999.

Department of Defense, *Quadrennial Defense Review Report,* (6 February, 2006).

Douglas Aircraft Company Ltd, *Preliminary Design of an Experimental World-Circling Spaceship* (Report No. SM-11827, 2 May, 1946).

Memorandum of conference with the President (October 8, 1957, 8:30 AM).

Moltz James. Clay. Dr, Deputy Director, Centre for Nonproliferation Studies, Monterey Institute of International Studies, *Charting a Course for Improved US Space Security,* written testimony to the US Congress Subcommittee on National Security and Foreign Affairs, (23 May 2007).

National Aeronautics and Space Act, introduced by Senators Lyndon Johnson and Styles Bridges, H.R. 11881, 14 April 1958.

National Security Council Planning Board, NSC 5814/1, *Preliminary US Policy on Outer Space,* Dwight D. Eisenhower Presidential Library and Museum, (20 June, 1958).

The National Security Strategy of the United States, 20 September 2002,

NSC 5918/1. *Draft Statement of US Policy on Outer Space,* Dwight D. Eisenhower Presidential Library and Museum (17 December, 1959).

NSDD 293, *Presidential Directive on National Space Policy,* (5 January, 1988).

NSPD-30 (NSPD-1), *National Space Policy,* NASA Historical Reference Collection (File: 012605), 2 November, 1989.

NSPD 49, *US National Space Policy*, (31 August, 2006).

PDD/NSC-49 (PDD/NSTC-8). *National Space Policy,* NASA Historical Reference Collection, File: 18242 *Clinton Space 1996,* 19 September 1996.

President John F. Kennedy, *Special Message to the Congress on Urgent National Needs,* John F. Kennedy Presidential Library and Museum, 25 May 1961.

Space Security 2006, *International Security in Outer Space Critical, Fragile and Rapidly Evolving,* (Spacesecurity.org, 10 July 2006).

UK Space, *Case4Space Summary Report*, October 2006.

US Joint Publication 3-14, *Joint Doctrine for Space Operations,* (9 August 2002).

US Transformational Flight Plan, November 2003.

Secondary Sources

Books

Bacevich Andrew. J, *The New American Militarism: How Americans are Seduced by War,* (Oxford University Press, 2005).

Bacon Francis, *New Atlantis* (1626) in *Three Early Modern Utopias,* (Oxford University Press, 1999).

Boorstin Daniel. J, *The Republic of Technology: Reflections on Our Future Community* (New York, 1978).

Bush Vannevar, *Modern Arms and Free Men; a Discussion of the Role of Science in Preserving Democracy,* (MIT Press, 1968).

Campbell David, *Writing Security: United States Foreign Policy and the Politics of Identity,* (University of Minnesota Press, 1998).

Dolman Everett. C, *Astropolitik: Classical Geopolitics in the Space Age,* (Frank Cass, London, 2002).

Ferguson Niall, *The Rise and Fall of the American Empire,* (Penguin Books, 2004).

Fursenko Aleksander and Naftali Timothy, *Khrushchev's Cold War,* (W. W. Norton & Company, New York, 2006).

Gaddis John Lewis, *Strategies of Containment: A Critical Appraisal of American National Security Policy During the Cold War,* (Oxford University Press, 2005).

Harvey Brian, *The Chinese Space Programme: From Conception to Future Capabilities,* (Praxis Publishing, 1998).

Jervis Robert, Perception and Misperception in International Politics, (Princeton University Press, 1976).

Johnson-Freese Joan, *Heavenly Ambitions: Will America Dominate Space?,* (Columbia University Press, 2006).

Lieber Robert J, *The American Era: Power and Strategy for the 21st Century,* (Cambridge University Press, 2005).

Long A. Franklin, Hafner Donald and Boutwell Jeffrey (eds), *Weapons in Space* (New York, 1986).

McDougall A. Walter, *The Heavens and the Earth: A Political History of the Space Age,* (New York, 1985).

Moltz James Clay, *Space Conflict or Space Cooperation?* 26 January 2006.

O'Hanlon Michael E, *Neither Star Wars Nor Sanctuary: Constraining the Military Uses of Space,* (Brookings Institution Press, Washington DC, 2004).

Scobell Andrew, *China's Use of Military Force: Beyond the Great Wall and the Long March* (Cambridge University Press, 2003).

Walzer Michael, *Just and Unjust Wars: A Moral Argument with Historical Illustrations,* (New York, 2006).

Webb James E, *Space Age Management: The Large-scale Approach,* (McGraw-Hill Book Company, New York, 1969).

Journals

Ajami Fouad, *The Falseness of Anti-Americanism,* Foreign Policy, (No. 118, September-October 2003).

Posen Barry. R and Ross, Andrew. L, *Competing Visions for US Grand Strategy,* International Security, (Vol. 21, No.3, Winter, 1996-1997).

Blair Bruce and Chen Yali, *The Space Security Dilemma,* China Security (Issue Number 2, 2006).

Gaddis John Lewis, *A Grand Strategy of Transformation,* Foreign Policy, (No. 133, November/December 2002).

Jervis Robert, *Cooperation Under the Security Dilemma,* World Politics (Vol. 30, No. 2. January 1978).

Jervis Robert, *Understanding the Bush Doctrine,* Political Science Quarterly, (118, No. 3, 2003).

Joan Johnson-Freese, *Strategic Communication with China: What Message about Space?,* China Security, (Issue Number 2, 2006).

Lewis Richard S, *The Kennedy Effect,* Bulletin of the Atomic Scientists (March 1968).

Nye Joseph S. and Owens William A, *America's Information Edge,* Foreign Affairs (Vol. 75, 1996), pp 20-36.

Posen Barry R and Ross Ross Andrew L, *Competing Visions for US Grand Strategy,* International Security, (Vol. 21, No.3, Winter, 1996-1997).

Roskin Michael, *From Pearl Harbour to Vietnam: Shifting Generational Paradigms and Foreign Policy,* Political Science Quarterly, (Vol. 89, No. 3, Autumn 1974).

Shambaugh David, *China's Military Views the World: Ambivalent Security,* International Security (Winter 1999/2000).

Articles

Butler Amy, Milspace*: Space Control Sees Small Piece of the Air Force's White Budget*, Aviation Week & Space Technology, (12 February, 2007), p27.

Butler Amy, *Turning Heads*, Aviation Week & Space Technology, (16 April, 2007).

Covault Craig, *Blame it on Nixon,* Aviation Weekly & Space Technology, (19 March, 2007).

David Leonard, *Experts Say Path Beyond Earth Orbit Has its Challenges,* Space News (29 November, 2004).

De Selding Peter B. US Export Restrictions Help Alcatel Win Chinasat 9, Space News, 21 June 2004.

Fulghum David. A. and Butler Amy, *Reassessing Space,* Aviation Week & Space Technology, (30 April, 2007).

Kecskemeti P, *The Satellite Rocket Vehicle: Political and Psychological Problems,* RAND RM-567, 4 October 1950.

LIFE Magazine, 21 October 1957.

Maddox Bronwen, *America Wants it all – Life, The Universe and Everything,* The Times, 19 October 2006.

Stoulig Jean-Michel, *Rumsfeld Commission Warns Against* "*Space Pearl Harbour*", Space Daily (11 January, 2001).

Taverna Michael. A and Morring Frank Jr, *Space Odyssey,* Aviation Week & Space Technology, (19 March, 2007).

Internet Sources

www.af.mil/library/posture/af_trans_flight_plan_2003.pdf

www.au.af.mil/au/awc/awcgate/whitehouse/ostp_space_policy06.pdf

www.aviationweek.com

www.celestrak.com/events/asat.asp

www.cns.miis.edu/pubs/week/060126.htm

www.cns.miis.edu/research/space/index.htm

www.dtic.mil/doctrine/je/new_pubs/jp3_14.pdf.

www.economist.com/index.html

www.eisenhower.utexas.edu/dl/Sputnik/MemoofConferencewithPresidentOct8 19571page.pdf

www.eisenhowerinstitute.org/programs/globalpartnerships/fos/newfrontier/we apons.htm

www.history.nasa.gov/

www.house.gov/coxreport/cont/gncont.html

http://www.jfklibrary.org/

www.oregonstate.edu/instruct/phl302/texts/bacon/atlantis.html

www.ostp.gov/html/US%20National%20Space%20Policy.pdf

www.presidency.ucsb.edu/libraries.php

www.space.au.af.mil/doctrine.htm

www.spacedaily.com/news/bmdo-01b.html

www.space.com/spacenews/businessmonday_041129.html

www.space.com/spacenews/archive04/alcatelarch_062104.html

www.unoosa.org/oosa/index.html